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Text Book on Latex

LATEX AND ITS INDUSTRIAL APPLICATIONS (Vol. I)
By Frederick Marchionna
Bibliography of latex patents and literature to June, 1932.

LATEX AND RUBBER DERIVATIVES AND THEIR INDUSTRIAL APPLICATIONS (Vols. II & III)
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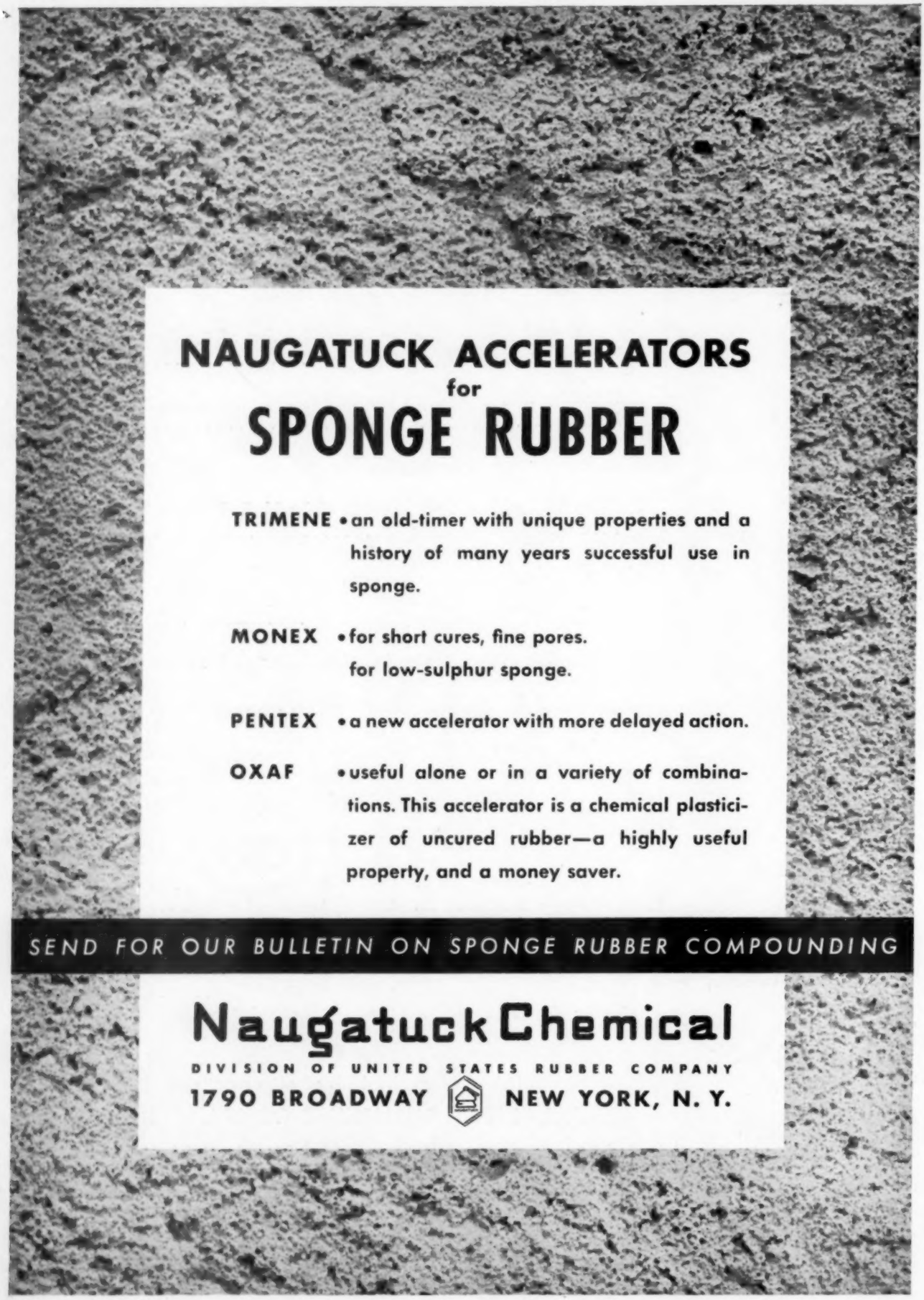
NAUGATUCK ACCELERATORS
for
SPONGE RUBBER
TRIMENE • an old-timer with unique properties and a history of many years successful use in sponge.
MONEX • for short cures, fine pores. for low-sulphur sponge.
PENTEX • a new accelerator with more delayed action.
OXAF • useful alone or in a variety of combinations. This accelerator is a chemical plasticizer of uncured rubber—a highly useful property, and a money saver.
SEND FOR OUR BULLETIN ON SPONGE RUBBER COMPOUNDING
Naugatuck Chemical
DIVISION OF UNITED STATES RUBBER COMPANY
1790 BROADWAY NEW YORK, N. Y.

The Rubber Age

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Vol. 45 August, 1939 No. 5

An Improved Method for the Determination of the Screen Residue in Clay

By C. A. Carlton

Mgr., Development Dept. J. M. Huber Corp.

THE conventional method in use for the determination of the screen residue in rubber pigments consists in placing the dry pigment on the desired screen, wetting with water and washing the pigment through the screen with a stream of water. In order to break up the agglomerates that are wetted with difficulty it is necessary to use a brush or the finger tip.

Some methods call for the use of alcohol or acetone to wet the pigment prior to washing with a stream of water, but brushing or rubbing is still necessary to separate all the fine material from the grit.

There are a number of rather serious objections to the current methods given above:

(1) It is very difficult, if not practically impossible, to obtain check results from one laboratory to another or even from one operator to another in the same laboratory using the same screen due to differences in the amount and/or severity of the brushing or rubbing used.

(2) With clay the test is rather slow due to the tendency of the fine clay particles to agglomerate and produce a rather viscous suspension making it very difficult to completely free the grit from the fine clay.

(3) When brushing or rubbing is used the life of the screen is comparatively short and there is danger of spreading the wires of the screen by forcing large particles through. Once the wires become spread, even very slightly, the results obtained are bound to be incorrect.

The improved method consists in thoroughly wetting each individual particle of the clay by the use of an efficient high speed stirring apparatus, and by the addition of an effective peptizing agent to the mixture of clay and water. Sodium pyrophosphate has been found to be a very effective material for use with clay.

A stirrer, such as is used in drug stores for the preparation of malted milks, is entirely satisfactory, such as the Hamilton-Beach Model No. 25 mixer having a 1 quart (946 cc.) capacity cup. The A.S.T.M. stirring apparatus in accordance with A.S.T.M. method D-422 is also admirably suited to this work.

The effectiveness of the sodium pyrophosphate as a peptizing agent for the clay in water can be demonstrated by preparing a mixture of 100 grams of Suprex clay and 400 cc. of distilled water. This mixture is quite viscous, flows and pours very poorly, and is difficult to wash through a 325 mesh screen. The addition of 0.5 grams of sodium pyrophosphate changes the viscous mix to one that flows through an orifice at the same rate as distilled water, making it very simple to wash the clay from the grit on the screen.

LEFT: Hamilton Beach Mixer, supplied with a special mixing cup which contains a series of baffles, suitable for thoroughly wetting each individual particle of the clay in the improved method for the determination of the screen residue in clay.

RIGHT: Stirring Apparatus made in accordance with A.S.T.M. Method D-422, available from E. H. Sargent & Company, which is also admirably suited to wetting each individual particle of clay as required by the new method discussed.

The advantages of the improved method are: (1) A saving in time required to perform the test; (2) More accurate results; the results can be duplicated from one laboratory to another within the limits of accuracy of the screens used; (3) Much longer life of the screen used; and (4) The data obtained gives a true picture of the amount of material present that is larger than the screen openings.

Standard Method for the Determination of 325 Mesh Screen Residue in Clay

I. Apparatus Required:—

(a) 1 High Speed Stirrer with one quart capacity cup such as Hamilton-Beach Model No. 25 (Hamilton-Beach Manufacturing Co., Racine, Wisconsin), or A.S.T.M. stirring apparatus in accordance with A.S.T.M. method D-422 (E. H. Sargent & Co., Chicago, Ill., Catalog No. S-74945).

(b) 1 U. S. Bureau of Standards No. 325 Screen, 3-inch diameter. Brass frame. Sieve opening—.044 mm. (.0017 in.). Wire diameter—.036 mm. (.0014 in.).

(c) 1 Graduated Cylinder or Pipette—25 cc. Capacity.

II. Chemicals Required:—

Sodium pyrophosphate solution made by dissolving 20 grams of anhydrous sodium pyrophosphate ($Na_4P_2O_7$) or 33.55 grams of sodium pyrophosphate crystals ($Na_4P_2O_7.10H_2O$) in 1000 cubic centimeters of distilled water.

III. Procedure:—

Place 100 grams of clay, 375 cubic centimeters of water, and 25 cubic centimeters of sodium pyrophosphate solution in the cup of the mixer and stir for 7 minutes.

Pour the mixture onto the screen which has previously been wetted with water and wash cup of mixer thoroughly. The mixture should be poured onto the screen slowly with one hand and a stream of water directed against the screen from a rubber hose with the other hand to prevent clogging of the screen. The force of the water stream can be regulated by squeezing the end of the rubber hose between thumb and forefinger.

Wash the clay through the screen with a stream of water until the wash water is clear and free from clay particles. This operation can be completed in one minute or less.

Wash the residue to one side of the screen, rinse screen and residue with distilled water and dry screen and residue in oven at 105°C.

Weigh screen and residue; remove residue from screen with camel's hair brush and weigh screen. Residue should be saved for microscopic examination to determine the nature of the residue. The residue should show no trace of clay particles smaller than the screen openings.

Notes: (1) If tap water is contaminated with grit or foreign matter the water should be passed through a 325 mesh screen before use. (2) The 3-inch diameter screen can be obtained to order from The W. S. Tyler Co., 3615 Superior Ave., Cleveland, Ohio. (3) The standard 6-inch or 8-inch diameter screens can be used in the determination by transferring the dried residue to a watch glass and weighing. However, more accurate results can be obtained by using the small screen as the error due to loss in transfer is avoided.

Reproduction of a U. S. Bureau of Standards No. 325 screen of 3-inch diameter recommended for use in the improved method. The screen depicted above is a product of the W. S. Tyler Company.

Saving Machine Costs By Electric Arc Welding

Castle Rubber Is Reported to Save An Average of 50% in Machinery and Equipment Costs Through the Adept Use of Electric Arc Welding

By G. G. Landis
Chief Engineer, Lincoln Electric Co.

A NEW METHOD of maintenance, which has been progressively studied and applied during the past five years, has made it possible for the Castle Rubber Company, E. Butler, Pennsylvania, to save fifty cents out of each dollar spent on its special production machines and shop fixtures. The process, which the company says has made it possible to "stretch" its maintenance dollar and thus save an average of 50% in costs, is electric arc welding.

Electric arc welding was adopted originally by Castle Rubber for use in repairing broken and worn equipment. However, during the past five years, use of the process has been extended to a point where simple repairs represent only a very small part of its application. Now, the company not only repairs all broken and worn equipment, but uses the process to build a variety of special machines for its own use. It is a case of what was once simply a useful method of making repairs becoming the principal method of building production equipment.

Five years ago the process was used for reclaiming molds, costing between $400 and $500, for a total cost of $2. It is still being used for such work. Just recently, the process enabled the company to build a special machine at large cost savings. At first, the welding was carried on in a corner of the machine shop in the main building. Today, welding is a department of the plant and is housed in a building erected particularly for this purpose. An indication of the extent to which this process has advanced is the fact that this building, itself, is all-welded steel construction, having been built from scrap pipe and purchased I-beams, channels, etc.

Illustrations accompany this article to show typical examples of this company's advantageous application of the process which has made it possible to obtain the savings reported.

Shown in Fig. 1 is an application of arc welding which first called the attention of the plant maintenance department to the possibilities of the process. Shown in this picture is a collection of rubber molds, many of which range in price between $400 and $500. When a mold becomes damaged, either through breakage or wear, it is reclaimed for approximately $2. Metal applied by the electric welding arc is used to join broken parts on the one hand and restore metal to worn surfaces on the other. Repairs, particularly to worn surfaces, can be made innumerable times, which means that the life of the molds is practically unlimited.

While on the subject of rubber molds, it is interesting to know that the same process which repairs them when they become broken is also used to fabricate

A view of the welding department of the Castle Rubber Company at E. Butler, Penna., where a variety of fabrication and repair work is done by arc welding in maintenance of its equipment. The company estimates that it saves an average of 50% in machinery and equipment costs by means of this department.

simple fixtures. The company reports it fabricates many of its less complicated molds from mild steel plate arc welded. A saving of approximately 75% in cost is obtained.

Fig. 1 is also interesting from another standpoint. The structure which is used to store these molds is of simple welded construction, built from plates, angle iron and flat bar stock. It is also interesting to note that the handles on the molds, which provide a means of easy lifting and carrying, are made of ½-inch round bars welded in place.

Beginning with Fig. 1 and referring, in order, to Figs. 2 to 8, inclusive, the reader will gain some conception of how arc welding has been progressively applied by Castle Rubber. These illustrations show arc welding applied to simple equipment, then to somewhat more complicated items and finally (in Fig. 8) to a large production machine.

The equipment illustrated in Fig. 2 are pan racks for use in the finishing department. They are fabricated of ¾-inch pipe and ¾x¾-inch angles. Note the provisions for a shelf in the frame-work of each rack. This can be seen clearly in the unit in the foreground in which two angles serve as slides.

The scale carriage, shown in Fig. 3, represents another step in the "evolution" of applying arc welding. It makes it possible to move the scales and mixing tubs to any one of a score of chemical drums where weighing must be done prior to mixing. The carriage is built of pipe and round bars cut up into proper lengths and arc welded together.

Note the steps towards somewhat more complicated equipment illustrated in Fig. 4. This is a battery of eight tumbling barrels, which is of all welded steel construction. They are built by taking sheet steel and cutting it up to form the various parts of tumblers, then welding the pieces together into the units pictured.

Note the advancement in welded fabrication suggested by the work illustrated in Fig. 5. Here, the welder has built a portable filing cabinet (at left), which, to the casual observer, is of conventional construction such as the one shown at the right of the illustration. The welded cabinet was built by the welder from ¾-inch pipe, 1-inch angle and 12-gauge steel, the latter of which comprises the reinforced top.

Sifting equipment is required by every company which manufactures products of rubber. Arc welding has been found a very effective method of fabricating this equipment, since it provides a type of construction capable of withstanding continuous vibration. In Fig. 6 can be seen an all-welded sifter fabricated from pipe and flat bar steel. The motor driven eccentric shaft which provides the vibration is an old truck axle. Immediately above the sifter tray can be seen a solid piece of steel. This is a 4x4x12-inch bar, the purpose of which is to add weight to the bottom of the mechanism, and, thus, keep the "tail from wagging the dog."

FIG. 1—A portion of one of the mold storage racks in the Castle Rubber plant. Molds are reconditioned in the plant for a cost of approximately $2.00 each by arc welding.

FIG. 2—View of the finishing department in the plant. These pan racks are built by arc welding methods, using ¾-inch pipe and ¾ x ¾-inch angles, at considerable savings.

FIG. 3—A scale carriage built from pipe and round bars by arc welding at the East Butler plant. This carriage permits moving the scales and mixing tubs to any preferred point.

FIG. 4—This battery of eight arc welded tumbling barrels was fabricated by Castle Rubber at its plant for its own use. Tumbling barrels are used in the making of several products.

In Fig. 7 we find an ingenious machine which is used for trimming off the tips of rubber remaining on extension cord handles after molding. The entire stand and interesting mechanism of this machine are of welded construction. To cut off the tips of rubber, the operator simply presses a foot-pedal which controls two razors. A study of the construction of this unit will indicate that the frame-work consists of pieces of steel pipe, arc welded together. The stool upon which the operator is sitting is also of welded steel construction.

This brings us to the high point in the application of arc welding by this company. In Fig. 8 is the machine which the company built itself at large savings. It is a roll grinder used for building up, wrapping and grinding steel mill rubber rolls. It is not a standard machine, and if purchased would have had to been built to specifications, and, according to the company, would have cost over $15,000. Designed by Russell Turner, president of Castle Rubber, the actual cost of the machine, built by the arc welding department, was $5,000. Entirely apart from the savings in cost, arc welding is said to have made possible a design which provides results not obtainable by conventional construction. An exclusive feature of the rolls produced by this machine is a circular crown.

A visit to the Castle Rubber Company plant would hardly be complete without a glimpse of the welding department. Included is a view of the welding shop where the "mechanical doctors" (arc welders) effect remarkable "cures" to injured or aged equipment. In addition to the arc welding machine, which can be seen in the illustration, the shop always maintains a wide variety of welding electrodes for fabrication and repair work on practically all metals and alloys, also for hard-facing work. The arc welding machine shown in the picture, as well as the various electrodes used by the company, are products of the Lincoln Electric Company, Cleveland, Ohio.

Summarizing the equipment which Castle Rubber fabricates by arc welding, we have: vulcanizers, packer stripper, roll grinder and builder, tube machine pan racks, rubber sifter, portable scale carriage, floor crane, overhead hoists, bale cutter, horses, portable tables, machine crates, storage racks, railings, cutting machines, mold storage racks, rubber molds, buffing stands, carton loading hoppers, stools, trimming machine, buffing machine, tray stands, washing machine, tumblers and piping.

Castle Rubber was organized about twelve years ago. It had three employees. Today, it employs 200 people and does specification work in rubber products such as auto pedals, pipe protector rings, light extension guard handles, golf balls, steel mill sheet catcher rolls, and many other specialty items for steel mills and oil fields.

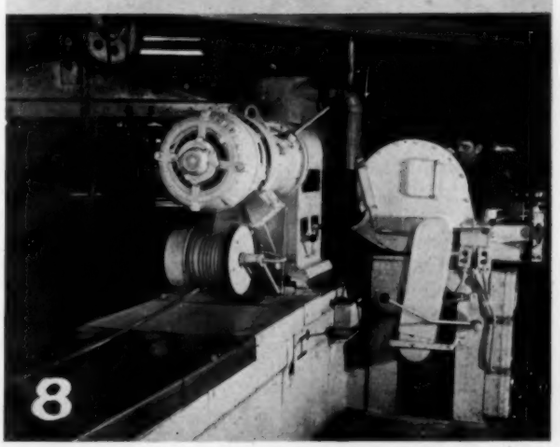


FIG. 5—The portable filing cabinet on the left was built from ¾-inch pipe, 1-inch angle, and 12-gauge steel by arc welding. A conventional filing cabinet is seen on the right.

FIG. 6—This sifting machine is arc welded from pipe and flat bars. The motor-driven eccentric shaft, which provides the vibration, is an old truck axle put to a brand new use.

FIG. 7—The entire stand and mechanism of this ingenious machine, which is used for trimming off the fins on extension cord handles after molding, are of arc welded construction.

FIG. 8—This roll grinder, built by Castle Rubber at a cost of only $5,000 by arc welding means, would have cost the company approximately $15,000 if purchased in the usual manner.

American Chemical Society to Honor Charles Goodyear

Goodyear Centennial Celebration is Major Attraction at the Society's 98th Meeting to be Held in Boston, September 11-15

THE most important meeting of the American Chemical Society held to date, from the standpoint of its Rubber Division, will take place in Boston, Mass., the week of September 11th. Never before has the Rubber Division scheduled so active a program as that set for the Boston meeting, the 98th meeting to be held by the Society. The major attraction at the meeting will be the Goodyear Centennial Celebration, plans for which have been formulating for the past year, commemorating the 100th anniversary of the discovery of vulcanization in 1839 by Charles Goodyear.

On Monday, September 11, the Rubber Division will participate in a joint symposium on "Plastics and Resins from Hydrocarbons" with the Divisions of Petroleum and Paint & Varnish Chemistry, while on Tuesday, September 12, it will join in another joint symposium, *i.e.*, "X-Ray Studies of Substances of High Molecular Weight," with the Divisions of Physical & Inorganic, Colloid and Organic Chemistry. These subjects are of vital importance to the rubber industry and the Society urges that rubber technologists endeavor to be present at both if possible.

Wednesday afternoon, September 13, will feature a general meeting of the entire American Chemical Society to celebrate the centenary of Goodyear's discovery of vulcanization. This general meeting, which will be held in Symphony Hall, located at Falmouth Street and Westland Avenue, is one of the highlights of the five-day session. Papers will be presented by E. B. Babcock, A. A. Glidden, R. W. Lunn (of England), and W. A. Gibbons, details of which will be found in the accompanying complete program.

The Rubber Division will not hold a separate banquet of its own this year, but instead is sponsoring the annual subscription dinner of the A.C.S. The banquet, which will be formal, will be held on Wednesday evening at the Copley-Plaza Hotel. It is open to all members of the Society and ladies are being invited. Tickets, which sell for $5.00 each, may be secured from Everett Morss of the Simplex Wire & Cable Co., Cambridge, Mass., treasurer of the Centennial Meeting. All tables are numbered and seat ten. Tickets will specify a definite table. Souvenirs will be distributed.

Additional tributes to Charles Goodyear and to the importance of his discovery of vulcanization to the modern rubber industry will be continued during the banquet at which talks will be given by P. W. Litchfield, president of Goodyear; Karl T. Compton, president of the Massachusetts Institute of Technology; and James B. Conant, president of Harvard University.

The technical sessions of the Rubber Division will be held on Thursday and Friday, September 14 and 15. The sessions will be held in the Parker House, headquarters for the Division during the meeting. The first session will be opened at 9:00 A.M., Thursday morning, by George K. Hinshaw, Chairman of the Division, with a few introductory remarks, following which a Symposium on the Vulcanization of Rubber will be started. This Symposium, which includes the presentation of 16 papers, will continue through all of Thursday afternoon and will occupy part of Friday morning.

The general session of the Division, during which 9 papers will be given, will get under way about 10.00 A.M. on Friday morning and will finish up on Friday afternoon. After the last technical paper has been presented, the Crude Rubber Committee of the Division will render its semi-annual report. The business meeting will conclude the program.

Abstracts of the 25 papers scheduled for presentation during the two-day technical session of the Rubber Division, together with titles and names and company connections of authors, follow herewith:

ABSTRACTS OF PAPERS

(In Order of Their Scheduled Appearance)

Thursday Morning—September 14

SYMPOSIUM ON THE VULCANIZATION OF RUBBER

9:05 A.M.—The Vulcanization of Rubber. ***Harry L. Fisher (U. S. Industrial Alcohol Co.).***

A review is given of the early history of vulcanization and the beneficial changes wrought on rubber by Goodyear's famous process. An outline is also given of the methods used in vulcanization, the principal facts, and the theoretical considerations of the chemistry involved. Non-sulfur vulcanizing agents are listed, including some hitherto not described, yellow mercuric oxide and the combination of phenols and oxidizing agents. A comparison of their chemical activity brings forth the generalization that probably in all cases a reduction and an oxidation take place. If the agent is already in the reduced state, then it is necessary to add an oxidizing agent. An oxidizing agent generally makes a better vulcanizate with almost all non-sulfur agents. The reduced form probably adds to the rubber hydrocarbon and this addition product is then oxidized to make the vulcanizate.

Since all vulcanizates seem to be fundamentally the same, it is postulated by analogy that some of the sulfur during vulcanization is reduced to hydrogen sulfide, that the hydrogen sulfide adds to the rubber hydrocarbon forming a mercaptan, and that this mercaptan is oxidized by some of the sulfur to form a disulfide which may connect two sections of the same or of two different molecules. It is shown that many of the facts of sulfur vulcanization are explained by this theory.

9:35 A. M.—The Physical Changes Induced by Vulcanization. ***W. W. Vogt (Goodyear Tire & Rubber Co.).***

Although the immediate object of Charles Goodyear's experiments which led to the discovery of vulcanization seemed to have been to produce a form of rubber less sensitive to the changes of temperature, happily the process also produced improvements in the mechanical properties of much greater value than the original objective. Thus, the field of usefulness of rubber was enormously expanded by virtue of the increase in tensile strength and the reduction of plastic flow and the relative stabilization of these properties against temperature changes.

10:00 A.M.—Effect of Vulcanization On the Structure of Rubber—A Problem in Probabilities. ***Warren F. Busse (B. F. Goodrich Co.).***

The large size of the crude rubber molecules makes it possible for only small traces of certain chemical reactions to have enormous effects on the mechanical or flowing properties of the rubber. It also makes it impossible at present to analyze the crude rubber sufficiently accurately to determine its true chemical structure, nor is it possible today to identify the enormous number of isomers that may be formed by chemical reactions. These facts explain why so little progress has been made in unraveling the many thousands or millions of reactions which may occur in the process of vulcanization.

While we may never know very much about the precise reactions, that occur during vulcanization under different conditions, physical and chemical data in the literature make it possible to distinguish a few of the different types of bonds that are formed between the rubber molecules. One type of bond is more or less reversibly broken by heat, and perhaps also by accelerators in solution. These bonds are important in overcures of high-sulfur stock containing zinc and accelerators and they probably involve secondary valence forces around sulfur atoms.

Other bonds which withstand elevated temperatures and are not broken by solutions of accelerators, are particularly important in high accelerator-low sulfur stocks. These may involve primary valence bonds such as C-S-C or even C-C bonds. During overcures reactions occur which affect not only the tensile strength and elongation, but also the chemical unsaturation, etc., but little is known of their value.

The role of accelerators, activators, and fatty acids in determining the kind as well as the rate of reactions of rubber with sulfur probably cannot be explained by assuming that each material acts on the preceding one in the series. Some probably act more on the rubber than on anything else.

To determine all reactions occurring during the vulcanization of various accelerated compounds would be a Herculean task, requiring not only new and far better physical and chemical tests than are available today, but also probably new and better interpretations of the data. However, such results would be extremely valuable, as they would make it possible to reduce very greatly the amount of empirical testing that has to be done in developing new compounds. Such a problem could well be tackled jointly by the whole rubber industry through a cooperative research program.

10:30 A.M.—Reinforcement as a Function of Vulcanization. ***C. R. Park (Firestone Tire & Rubber Co.).***

A critical review is made of the suggestion that rubber-sulfur complexes formed during vulcanization are dispersed through the mix in the manner of fine powders and thus account for the physical effects. The explanation is rejected.

Certain data in the literature are interpreted as indicating that the effect noted by Menadue is due to oxidation effects.

Facts concerning the behavior of zinc oxide in rubber-sulfur mixes are reviewed and it is suggested that this gelation may be caused by precipitation of metallic soap in some form which results in reinforcement.

The literature on retardation of cure by powders is reviewed and the reconciliation of the several points of views by more recent data is noted.

10:55 A.M.—X-Ray Structure of Vulcanized Rubber. ***G. L. Clark (Dept. of Chemistry, University of Illinois).***

A review is given of all the significant X-ray results on the structure of rubber since the original work of Katz on stretched rubber in 1925. This serves as a basis for comparison of results on vulcanized rubber, and for a critical consideration of structural models proposed for rubber, and for the role of sulfur as a vulcanizing agent. The most important observations are:

(1) The spacings and structure for stretched rubber are identical before and after vulcanization.

(2) A three-times greater extension is required after vulcanization to produce a crystal fiber pattern.

(3) Remarkable hysteresis effects are observed in the appearance and disappearance of crystal interferences as tension is applied and released.

(4) Unvulcanized sol rubber produces no crystal fiber patterns even at 1000 per cent elongation, but after vulcanization gives a pattern at 200 per cent elongation.

Program of the

DIVISION OF RUBBER CHEMISTRY AMERICAN CHEMICAL SOCIETY

Boston, Mass., September 11 to 15, 1939

Monday Morning and Afternoon
September 11

Joint Symposium on "Plastics and Resins from Hydrocarbons" with the Divisions of Petroleum and Paint & Varnish Chemistry.

Tuesday Morning and Afternoon
September 12

Joint Symposium on "X-Ray Studies of Substances of High Molecular Weight" with the Divisions of Physical & Inorganic, Colloid and Organic Chemistry.

Wednesday Afternoon—September 13

(General Meeting of the Entire Society Celebrating Centenary of Discovery of Vulcanization by Charles Goodyear)

What Is Vulcanization?—By E. B. Babcock, Chief Chemist, Firestone Tire & Rubber Co.
The Work of Thomas Hancock—By A. A. Glidden, Development Manager, Hood Rubber Co.
The Work of Charles Goodyear—By R. W. Lunn, Managing Director, Leyland & Birmingham Rubber Co., England.
The Rubber Industry Since 1839—By W. A. Gibbons, Director of General Development, U. S. Rubber Co.

Wednesday Evening—September 13

(Subscription Dinner at the Hotel Copley-Plaza under Auspices of the Division of Rubber Chemistry)

John M. Bierer—Toastmaster

Rubber's Position in Modern Civilization—By P. W. Litchfield, President, Goodyear Tire & Rubber Co.
Looking Forward in Research—By Karl T. Compton, President, Massachusetts Institute of Technology.
Lessons From the Past—By James B. Conant, President, Harvard University.

Thursday—September 14
(At the Parker House)

9:00 A. M.—Introductory Remarks by George K. Hinshaw, Chairman of the Rubber Division.
9:05-11:55 A. M.—Symposium on the Vulcanization of Rubber.
1:30-5:00 P. M.—Symposium continued.

Friday—September 15

9:00-10:00 A. M.—Symposium on the Vulcanization of Rubber—continued.
10:00-11:55 A. M.—General Session.
1:30-3:15 P. M.—General Session—continued.
3:20 P. M.—Report of the Crude Rubber Committee.
3:45 P. M.—Business Meeting.

GOODYEAR CENTENNIAL COMMITTEE

John M. Bierer (Chairman)
A. A. Somerville
G. K. Hinshaw (Ex-Officio)
W. B. Wiegand
C. R. Boggs
E. B. Curtis (Ex-Officio)

(5) The contention of many years, that the fiber spots for stretched rubber after once appearing do not change in sharpness or position but merely increase in intensity as new crystal individuals are formed with increasing elongation, is disproved by patterns characterized by long arcs instead of sharp spots.

(6) There is some evidence of sharper interferences after vulcanization, possibly indicating an enlarged crystallite size, by means of sulfur linkages.

Though there is some support for the two-phase theory of rubber structure, for the existence of crystallites rather than singly acting molecules, and for a physical rather than chemical interpretation of vulcanization, since chemically bound sulfur or bridge formation might reasonably be expected to exert some structural effect which should be apparent on diffraction patterns, the very useful x-ray results cannot be said to answer unequivocally either what is rubber, or what is vulcanization.

11:20 A.M.—The Effect of Variability of Rubber on Vulcanization. ***Edgar Rhodes (British Rubber Producers Research Association).***

The foreword gives a brief history of the exploration of the variability of plantation rubber by vulcanization testing.

Until recently, vulcanization testing in the producing countries was carried out almost exclusively on simple rubber-sulfur mixes. The results of such tests are discussed in the light of the argument that they can be of little value to the consumer, since the testing mixes bear little relation to compounds in common trade use.

The testing formula approved by the Rubber Division of the A.C.S. and the old rubber-sulfur mix have both been used as a basis of comparison of a series of plantation rubbers in order to test the degree of parallelism of the old and the new techniques. The two testing recipes give results which are more similar than might have been expected from the strength of the criticism of the simple mixes by rubber technologists.

Some examples are given of the extent of the natural variability due to special causes, notably tapping systems, and this variability is compared with that introduced by the producer during preparation.

Thursday Afternoon—September 14

1:30 P.M.—Methods for Control of Vulcanization by the Individual Incorporation of Vulcanizing Agents. ***D. F. Twiss (Dunlop Rubber Company).***

Consideration is given to various forms of procedure in which introduction of one or more of the vulcanizing ingredients into the rubber is delayed until after the main mixing operation. This may occur in latex processes and is well known in various methods for the incorporation of constituents for the formation of a complete accelerator-complex in rubber by diffusion. Modifications of this latter procedure are indicated.

2:00 P.M.—Theories of Acceleration. ***L. B. Sebrell (Goodyear Tire & Rubber Co.).***

The various theories that have been advanced from time to time over the past thirty-one years to explain the action of organic accelerators and the mechanism of acceleration, are given. Wherever consistent, a chronological order of discussion has been adopted, beginning with the work of Erdmann in 1908.

Earlier theories were confined for the most part to a purely chemical consideration for an explanation of acceleration. Recently the trend is toward a physical or physico-chemical method to investigate and correlate the facts concerning the action of accelerators. The principal theoretical discussions may be enumerated as follows:

1. Erdmann (1908) explained the accelerating action of sodium polysulfides by the assumption that thiozonide S_3 was formed and passed to the rubber. Vulcanized rubber was considered to be a thiozonide.

2. Ostromislensky (1916) proposed a similar explanation to account for the accelerating action of organic bases through the formation and subsequent decomposition of an amine trithiozonide or sulfene amine.

3. Dubosc (1918) considered the mechanism of acceleration to be due to the formation of thiocyanic acid and its decomposition into hydrogen cyanide and an active form of sulfur capable of reacting with rubber to bring about vulcanization.

4. Kratz and co-workers (1920) explained the action of amines through the formation of an additive compound with sulfur. This theoretical substance finds analogous compounds in tertiary amine oxides. This compound was considered a carrier of sulfur to rubber.

5. Bedford and co-workers (1921) classified accelerators as hydrogen sulfide polysulfide accelerators to explain the action of amines; and carbosulfhydryl polysulfides to account for the activity of dithiocarbamates, dithio acids, and their derivatives.

6. Bruni and Romani (1921) believed disulfides to be the true accelerator from the observation they made that certain disulfides such as the thiuram disulfides would bring about vulcanization of rubber without the addition of sulfur.

7. Feuchter (1925) made a positive contribution in that he considered a complex compound of accelerator and sulfur to react with rubber at the double bonds. The accelerator was assumed to form a part of the vulcanizate. This would account for the observed disappearance of accelerators during vulcanization.

8. Naunton (1926) in discussing the action of certain basic accelerators considered the addition of the accelerator to rubber. This was considered to offer a point of attack for the addition of sulfur.

9. Nordlander (1930) supposed an adsorption of accelerator by rubber at the double bonds. These adsorbed compounds then react with the activiated sulfur molecules.

10. Behre (1933) offered a physico-chemical explanation of the action of accelerators. This is based upon the consideration that rubber is made up of negatively charged particles.

11. Margaritov (1936) stated that when amines are added to the system rubber-sulfur they are adsorbed on the sulfur, aiding in dispersion of sulfur and increasing the surface of contact between rubber and sulfur.

12. Langenbeck and Rhiem found through solubilities of sulfur and disulfide accelerators that an unstable compound of the two is formed. This is assumed to take place in rubber and serves as a method of activating sulfur.

2:30 P.M.—The Vulcanization of Rubber from a Thermodynamic Viewpoint. ***Ira Williams (J. M. Huber Corp.).***

The study of vulcanization from a thermodynamic viewpoint has not progressed beyond the elementary stages. A study of the polymerization of isoprene shows it to be possible to produce a vulcanized type polymer by direct polymerization. The relation between this polymer and natural rubber is unknown. The heat liberated during vulcanization bears a direct relation to the amount of combined sulfur and not to the change in physical properties of the rubber. Pigment incorporation in rubber produces vulcanized properties with little measurable energy change. The relatively small amount of experimental evidence indicates that the change in physical properties from unvulcanized to a vulcanized state is accompanied by a relatively small energy change.

2:55 P.M.—The Mechanism of Oxidation of Vulcanized Rubber. Effect of Temperature, State of Cure, and Thickness. ***A. R. Kemp, J. H. Ingmanson, and G. S. Mueller (Bell Telephone Laboratories, Inc.).***

A previous investigation of the rate of oxidation at 60°, 70°, and 80°C. has been extended to 90°, 100°, and 110°C. The effect of time of vulcanization and specimen thickness on oxidation rate at 80°C. has also been determined. Studies were limited to the range of oxidation which accounts for substantial deterioration of physical properties. Physical deterioration has been correlated with quantity of oxygen absorbed.

It was found that the rate of oxidation up to 90°C. is a linear function of time but at 100° and 110°C. the rate decreases as oxidation progresses. Over the temperature range 60° to 110°C. the rate of oxidation approximately doubles for each 7.5°C. increase in temperature, corresponding to a temperature coefficient of oxidation of 2.5 for each 10°C. rise in temperature.

The quantity of absorbed oxygen corresponding to a given

deterioration in tensile strength decreases as the temperature of oxidation is raised. With increased time of vulcanization the rate of oxidation increases and the quantity of oxygen equivalent to a given physical deterioration decreases. Variations in thickness of specimens have no effect on oxidation rate at 80°C. with a compound containing an antioxidant. The rate of oxidation is greatly reduced by vulcanizing with tetramethyl thiuram disulfide in place of sulfur.

3:20 P.M.—Influence of Vulcanization on Oxidizability. Vulcanizing Agents Other Than Sulfur. ***Charles Dufraisse and J. Le Bras (Institute Francais du Caoutchouc, Paris, France).*** **(To be read by A. R. Kemp of the Bell Telephone Laboratories)**

No abstract available.

3:45 P.M.—What is Optimum Cure? ***J. C. Walton (Boston Woven Hose & Rubber Co.).***

Since the advent of vulcanized rubber goods the industry has strived to develop a method for measuring best cure. Early hand and tooth tests were abandoned in favor of tensile and elongation measurements, and subsequently methods for measuring this best cure were proposed. Tensile strength, tensile product and permanent set are perhaps the criteria which have been most widely used.

All such properties are, however, unsatisfactory for estimating the optimum cure of a rubber product for a particular service, first because their maximum values are not reached at the same time of cure, and secondly because these characteristics are not in themselves reliable criteria of behavior in service.

The terms "optimum cure" and "technically best cure" are incomplete, and are of significance only when they are qualified by reference to some particular property which it is desired to be at the optimum point.

4:10 P. M.—Temperature Coefficient of Vulcanization. ***R. H. Gerke (U. S. Rubber Co.).***

The manufacture of vulcanized rubber articles and the usefulness of manufactured rubber articles depend, to a large extent, upon temperature coefficient of vulcanization. While this is more or less taken for granted, it may be well to pause and enumerate the consequences if vulcanization had no temperature coefficient.

If the vulcanization reaction had no temperature coefficient, the rate of vulcanization would be a constant and entirely different techniques would have to be employed. As the matter stands today, rubber is vulcanized at an elevated temperature in a reasonably short time and relatively little vulcanization takes place in manufactured articles in use. It is upon these two fundamental bases that the rubber industry exists today.

In spite of the tremendous importance of temperature coefficient of vulcanization, there are, unfortunately, very little published data. The data consist of the effect of temperature on the mold vulcanization of unaccelerated and accelerated soft rubber and hard rubber. These data have been collected, compared, and analyzed. The temperature coefficient of soft rubber containing reclaim has also been made available by private communication.

On the other hand, data on the temperature coefficient of vulcanization in air, steam, ammonia, nitrogen, and carbon dioxide are not available in the literature, which is unfortunate indeed.

To summarize, the available data on temperature coefficient of vulcanization have been analyzed with the aid of the Arrhenius equation. This anlysis shows that the rate of combination of sulfur with rubber during vulcanization is a chemical reaction which exhibits a normal temperature coefficient. This fact enables the rubber technologist to place the technology of rubber on a scientific basis and control the degree of vulcanization of manufactured articles which, in turn, is very important with respect to service performance.

Friday Morning—September 15

9:00 A.M.—Effect of Reclaimed Rubber on Temperature Coefficient of Vulcanization. ***W. S. Coe (Naugatuck Chemical Division, United States Rubber Company).***

Temperature coefficients of vulcanization have been determined by free sulfur, T-50, and modulus data for five compounds: (A) with no reclaim, (B) with alkali whole tire reclaim, (C) with acid type whole tire reclaim, (D) with tread reclaim, and (E) with red tube reclaim. Compounds B and D gave considerably higher values than compound A by all three methods. Stocks C and E gave intermediate values by all methods.

The T-50 method has the advantage of simplicity and speed and is quite adequate for most practical purposes. The free sulfur method is probably most accurately reproducible and not unduly difficult to perform. The modulus method, although preferred by some because of the greater practical significance of this property, has the disadvantage of being carried out on undercured compounds and involves considerable discretion in selection of conditions.

Values determined from modulus data are in general somewhat lower than those obtained by free or combined sulfur methods. In this investigation, values by the T-50 method are closer to those by modulus in case of most of the stocks containing reclaim but the T-50 value for the non-reclaim stock is very close to the free sulfur value and somewhat higher than that determined by modulus.

9:20 A.M.—Low Temperature Set as a Measure of State of Vulcanization. ***J. H. Fielding (Goodyear).***

When rubber is vulcanized with sulfur its tendency to freeze under tension is altered. This property has found quantitative expression in the T-50 test, a well-known means of estimating state of vulcanization.

In the T-50 test the percentage of set is the constant and the temperature required to produce a given set becomes the variable. In the present method, the temperature of the test is kept constant and the variation in the amount of set produced becomes the measure of the change in state of vulcanization. The method is quantitative and has the advantage of simplicity in equipment and manipulation.

9:45 A.M.—Vulcanization of Latex. ***C. E. Bradley (U. S. Rubber Co.).***

No abstract available.

General Meeting

10:10 A.M.—The Rubber-Like Properties of Polybutene. ***W. J. Sparks, I. E. Lightbown, L. B. Turner, per K. Frolich, and C. A. Klebsattel (Standard Oil Development Co.).***

Polymers prepared by polymerizing butenes at low temperatures resemble rubber in many physical characteristics. They differ from rubber chemically in that they are essentially saturated.

The polybutenes have not thus far been vulcanized by conventional methods; they are inert toward ozone and concentrated acids; when stretched they exhibit an x-ray pattern similar to that of rubber; they may be mixed with rubber to improve its ozone and acid resistance; spheres of polybutene at room temperature do not bounce, but elevating the temperature to 100°C. produces rebound close to that of rubber.

Because rubber and polybutene are physically similar but chemically dissimilar, a comparison of the two permits of conclusions concerning those properties for which unsaturation alone is responsible. Based on this comparison vulcanization, ozonization and oxidation are manifestations of unsaturation.

The following physical properties of the higher molecular weight polybutenes closely resemble those of rubber and therefore appear to be largely independent of orientation due to carbon-double-bond-carbon configuration: tensile strength, elasticity, rebound, x-ray structure, electrical properties, elastic memory, fractional solubility, and mechanical orientation.

10.40 A. M.—Catalytic Dehydrogenation of Monoölefins to Diolefins. ***Aristid V. Grosse, J. C. Morrell, and Julian M. Mavity (Universal Oil Products Co.).***

Monoölefins have been dehydrogenated catalytically to give conjugated diolefins of the same carbon framework. The most satisfactory catalysts consist of chromium, molybdenum, or vanadium oxide on alumina. Since the reaction is favored by low pressures and high temperatures the conditions usually used were 0.25 atmosphere or less and 600° to 650°C. The diolefins formed were butadiene-1, 3 from n-butylenes; isoprene from 3-methylbutene-1 and from a mixture of 2-methylbutene-1 and 2-methylbutene-2; and piperylene from pentene-2. The once-through yields varied from 20 to 30%; ultimate yields of butadiene-1, 3 up to 80% were obtained. Cyclopentadiene was obtained by dehydrogenating cyclopentane.

11:05 A.M.—Dielectric Constant of Rubber-Carbon Black Mixtures. ***C. M. Doede (Connecticut Hard Rubber Co.).***

A study has been made of the effect of the carbon black concentration, carbon black particle size, and frequency of the applied voltage upon the dielectric constant of vulcanized and unvulcanized rubber-carbon black mixtures.

The dielectric constant has been shown to increase with carbon black concentration, decrease with the frequency of the applied voltage and for a given black concentration and frequency, to increase very rapidly with decrease in particle radius when the particle radius is of the order of one-tenth micron or less.

These observations have been explained with the assumption that the interparticle distances must be sufficiently small to allow interaction of the fields of activity surrounding adjacent particles. This interpretation is in agreement with the observations of Freundlich and of Kallman and Wilstatter.

11:30 A.M.—Practical Evaluation of Commercial Rubber Carbon Blacks by X-Ray Diffraction. ***G. L. Clark and H. D. Rhodes (Department of Chemistry, University of Illinois).***

The ultimate particle sizes of 13 carbon blacks commonly used in the rubber industry were determined by both the Laue and Scherrer methods (the latter modified to a wedge sample procedure). In addition, the particle sizes of 5 other commercial blacks were determined by the Scherrer method alone. All particles were found to have dimensions lying in the ranges: 12.56 A. to 20.98 A. for the 002 direction, 12.91 A. to 25.32 A. for the 100 direction.

The particles of all samples investigated were almost equidimensional in shape and no extended shapes such as long needles or flat plates were noted.

Good checks of particle size data were obtained in all cases where the Laue values were compared with the results of the Scherrer method. Coupled with the facts that the wedge samples gave slightly more distinct and consequently more easily measured patterns, that the technique of the wedge method is much simpler to employ than that of the Laue method, and that the calculation of the former are much more readily carried out than those of the latter, these checks argue in favor of the use of the 30° wedge and Scherrer camera for carbon black work.

Evidence was presented to show the inadequacy of the microscopic method for particle size determinations of carbon blacks if the investigator is concerned with the size of ultimate particles rather than secondary aggregates.

The average number of primary particles per secondary aggregate was calculated for 5 samples of carbon blacks. These numbers ranged approximately from 10^2 to 10^7.

The method of evaluating particle size in the blacks is extended to rubber mixes, in which the difficulty arises that the diffraction halo for rubber interferes with the strong 002 interference of the black. However, the 100 interference may still be used and since most of tthe blacks have essentially equidimensional particles, the single determinations suffice for an approximation. Removal of the rubber by swelling, refluxing and solution, and separation of the black by high-speed centrifuging permits resolution of the 002 interference.

Besides particle sizes parallel data are given and compared on 13 black samples for apparent density, particle area, total surface in square meters per gram, active surface from methylene blue adsorption, and diphenyl guanidine adsorption; and data for cured tread stocks containing these blacks on tensile strength, 400% modulus, and Shore durometer readings.

Friday Afternoon—September 15

1:30 P.M.—Statistical Theory of the Elastic and Thermoelastic Properties of Vulcanized Rubber. ***Eugene Guth, (Department of Physics, University of Notre Dame).***

A statistical theory of the elasticity of rubber and similar high molecular compounds was put forward by the author several years ago. A further development of the theory applied to vulcanizates yields the dependency of the stress upon temperature and elongation for both extension and compression. No arbitrary constants, except a scale factor, enter into the theoretical formula. It is shown that the statistical theory holds also for hindered rotation, in addition to completely free rotation.

The structure of vulcanizates assumed is that of long-chain molecules interlinked by crossbonds (primary or secondary valences) to a three-dimensional network. The crossbonds may be sulfur bridges, but this is not a requirement. The experimental evidence concerning the dependency of the stress upon temperature and upon both extension and compression is in agreement with the theory.

1:55 P.M.—A New Method for Measurement of the Permeability of Rubber to Various Gases. ***A. S. Carpenter and D. F. Twiss (Dunlop Rubber Company).***

The processes of permeation of a gas through a sheet, and absorption by a block are analyzed and compared. The same factors, solubility and diffusion constant, are shown to govern rate of permeation and rate of absorption, and a method is given for assessing both of these factors independently by following the absorption of gas by a block. From the results, the permeability of a sheet can be deduced. The method eliminates difficulties and errors of the direct method and trustworthy, accurately reproducible results are obtained. Apparatus suitable for the purpose is described and some experimental results are recorded.

2:20 P.M.—The Dynamic Fatigue Life of Rubber. ***S. M. Cadwell, R. A. Merrill, C. M. Sloman, and F. L. Yost (United States Rubber Company).***

The gradual deterioration and final rupture of a rubber member due to mechanical vibrations imposed on it is called dynamic fatigue. Mention has previously been made in the literature that the dynamic fatigue life of rubber is less when the minimum of the oscillation cycle falls near zero strain; but heretofore no complete study, as given in the present paper, has been published in which the fatigue lives of rubber as a function of the oscillation stroke are examined for minimum distortions varying from high compressions through all possible elongations.

The general dynamic fatigue characteristics of rubber in linear vibration in a dark, dry enclosure are (L_{min} = minimum length during the vibration; L_o = free unstrained length):

(1) For a given oscillation stroke the dynamic fatigue life is a minimum when $L_{min} = L_o$;
(2) For a constant value of L_{min} the dynamic fatigue life decreases as the oscillation stroke increases;
(3) For given strain limits of oscillation the dynamic fatigue life is usually lower the harder the stock;
(4) The dynamic fatigue life depends critically on the rubber temperature.

It is shown that the dynamic fatigue life of rubber worked in shear can be related in a qualitative way to the dynamic fatigue life of rubber vibrated through linear strains.

2:40 P.M.—The Analysis of Rubber for Antioxidants. ***L. H. Howland and E. J. Hart (U. S. Rubber Co.).***

The technique of quantitative antioxidant analysis which employs a turpentine oxidation method is covered in detail. The relations between the amount of antioxidant present in acetone extracts of the rubber compounds and the induction period in the turpentine oxidation reaction have been worked out and applied to antioxidant determinations in rubber. Certain qualitative tests are also given for the detection of antioxidants in a tire tread vulcanizate.

3:00 P.M.—The Chloroform Extract of Reclaimed Rubber. ***Henry F. Palmer and F. L. Kilbourne, Jr. (Xylos Rubber Co.).***

The effect of the various operations in the reclaiming process on the magnitude of the chloroform extract of reclaimed rubber is discussed. The chloroform extract of any given reclaim is increased by (1) longer time of heat treatment at a given temperature, (2) increase in temperature of heat treatment, (3) decrease in refining temperature, and (4) increase in number of passes through a refiner.

An increased chloroform extract means greater softness and plasticity for any given reclaim, but different types of reclaim with equivalent chloroform extracts may have widely different plasticities. The use of oils as plasticizers in preference to excessive heat plasticization is desirable in producing many types of reclaimed rubber. A high chloroform extract is not a criterion of improved quality; a performance test must be used. A specification for chloroform extract determination is given.

Rubber at the New York World's Fair

U. S. RUBBER, DUPONT AND FORD EXHIBITS

IN previous issues we have described the exhibits of Firestone and Goodrich at the New York World's Fair. This month's descriptions will be devoted to the exhibits maintained by the United States Rubber Company, E. I. du Pont de Nemours & Company, and the Ford Motor Company. While the latter two companies are displaying all of the varied products each manufactures, rubber is given due prominence in their respective exhibits.

U. S. Rubber's Exhibits

Two exhibits are maintained at the Fair by U. S. Rubber, one on "Lastex" yarn in the Consumers Building, and the other on foamed latex products in the Home Furnishings Building. The "Lastex" exhibit, designed by Robert Heller, New York industrial designer, is the most important and comprehensive display ever staged for the company's elastic yarn.

The "Lastex" yarn exhibit occupies an area of 1,300 square feet, is semi-circular in shape, and is approximately 50 x 35 feet in size. Stressing the uses and advantages of the material, it features a ramp of fashion, a miniature fashion theatre with mechanized mannequins, show windows, a stretching device, fabric and yarn displays, and other elements designed to attract and hold the public attention. Its color scheme is off-white trimmed with French blue, with white and blue cut-out lettering, and overhead lighting with 24 spot lights of various sizes and colors.

The ramp of fashion is made of aluminum and glass, brilliantly lighted by multi-colored theatrical spotlights. On the ramp clothes for every event of the day, all utilizing "Lastex" yarn in some application, are shown on life-sized mannequins especially sculptured by Jean Spadea of New York. The ramp is shaped like the letter "J" and rises from within a foot of the floor to a height of three feet, widening as it goes. It is protected by a waist-high enclosure of plate glass with chromium trim. The mannequins, ten of which are used on the ramp, display bathing suits, riding habits, girdles, sports dresses, formal evening gowns, evening dresses, and other articles of apparel for women. Flat merchandise is also grouped on the floor of the ramp.

In the miniature fashion theatre eight 26-inch mannequins revolve on a circular stage 8 feet in diameter. By means of a continuous mechanism, each mannequin stops in the center of the stage for a few seconds. These mannequins, also designed by Jean Spadea, parade the newest fashions in underthings and outer apparel, from laces to leathers, from chiffon gowns to tweed riding clothes, against attractive diorama backgrounds.

The show windows, five in all, circle the ramp of fashion and display infants wear, women's lingerie and accessories, etc. One window is devoted to fash-

Part of the Ramp of Fashion which features the "Lastex" exhibit of the U. S. Rubber Company at the World's Fair.

ions for men, including pajamas, swim suits and a smart pair of white buckskin shoes made stretchable by the use of "Lastex" yarn. Also present is the famous "Lastex" girl trade mark in the form of a life-size figure in pure white holding aloft a cone of yarn with strands of yarn wound around body, legs and arms. A special spotlight in the ceiling of the exhibit building makes this imposing figure stand out conspicuously.

The fabric and yarn displays are interestingly handled. In the former, overlapping pieces of variously colored fabric made with "Lastex" yarn are arranged in a cone at the base of the pedestal under the life-size trade-mark figure, while for the yarn display, colored metal rods simulating yarn fan out from behind the figure, passing over the bulkhead behind her and terminate in a row of variously colored actual cones of "Lastex" yarn on the top of the front containing the show windows.

To demonstrate the stretchability of the "miracle yarn", three pieces of colored fabrics and one piece of colored shoe leather are stretched simultaneously on a stretching device located in the exhibit. Samples of latex and of "Lactron", the term given to the core yarn of "Lastex" yarn, are on display near the stretching device. For visitors wanting to do their own testing, a set of end opening books containing large swatches of various types of fabrics—silk, cotton, wool, rayon, lace, satin, etc.—is provided. Each swatch has a pulling handle on the outside end. Although names of manufacturers of the various finished apparel are not listed, attendants give visitors wholesale and retail sources upon request.

The second U. S. Rubber exhibit, that for foamed latex products located in the Home Furnishings Building, occupies a space of 30 x 25 feet. On the wall at

the back of the exhibit are suspended three large murals, bearing the respective captions: "Wear Tested by Greyhound", "Comfort Tested by Pullman", and "Weight Tested by Douglas". Seat cushions, made of foamed latex sponge, for busses, pullmans and airplanes, are placed in front of the respective murals permitting the visitor to prove each point claimed for himself. On either side of the murals are cross-sections of bedrooms featuring foamed latex mattresses and sectional chairs depicting the use of foamed latex upholstery.

This exhibit is completely carpeted, one reason being that it provides an opportunity to demonstrate the effectiveness of U. S. Rubber's sponge rubber carpet underlay. Ridges in this underlay, which is made of regular sponge rubber and not of the foamed latex type, provide for buoyancy and air conditioning. Attendants point out this feature by means of sample blocks of sponge rubber similar to the type used in the production of the carpet underlay. Use of blown-up displays of U. S. Rubber's "Sumatra Girl", used as a trade-mark in advertising the foamed latex sponge products, adds to the appeal of the exhibit.

Neoprene in DuPont Exhibit

Captioned the "Wonder World of Chemistry", the exhibit of E. I. du Pont de Nemours & Co., Inc., at the New York World's Fair is, in effect, a panorama of recent chemical progress and change. In it, DuPont presents the first complete review of its major accomplishments against a background of bubbling chemicals, flashing lights and the largest array of laboratory apparatus ever assembled for show purposes.

Entering the DuPont Exhibit Building the visitor's eye is caught by a large 60-foot mural depicting chemistry's part in creating products for "better living" from the raw materials of forest, farm and mine. The theme figures of the mural, created by Domenico Mortellito, are carved in intaglio relief from varicolored "Lucite" while smaller carvings of "Plastacele" add contrast. Subtle highlights are achieved through hidden illumination.

The main hall of the building is divided into three sections, one disclosing the background of the company's research by means of working models and demonstrations, the second devoted to laboratory control, and the third presenting the manufacturing story, with plant-size machinery actually fabricating several DuPont materials into finished products for consumer and industrial use. For instance, at one booth visitors may watch a loom weave viscose rayon yarn into a colorful fabric. At another, an injection molding machine turns out "Plastacele" combs. At still another, the manufacture of neoprene products is demonstrated.

Mixing a batch on a laboratory mill, as the operator is doing, is part of the neoprene demonstration.

In the neoprene demonstration, the operator, George DeHolczer, mixes a batch on a Thropp laboratory mill, places portions of the mixed compound into a mold, puts the mold into a Thropp laboratory hydraulic press, and thus shows the public how neoprene compounds are vulcanized to form rings of square cross section. Each step is accompanied by running comment from the operator, who also answers any questions raised by the audience.

At the completion of the vulcanization process (which is performed intermittently only) the neoprene rings are mounted on a Scott tensile tester along with rubber rings to prove to the public that the tensile and elasticity of both types of rings are identical. The tester is equipped with large dials which indicate the force required to break the rings.

After this test, the operator conducts a similar test with neoprene and rubber rings which have been previously immersed in oil for seven days at 140° F. This latter test indicates the superiority of neoprene rings over rubber rings after extended exposure to deteriorating influences. Neoprene, DuPont's chloroprene rubber made from coal, limestone, salt and water, is characterized by its oil resistance. Concluding the demonstration, the operator displays various products made from neoprene, such as gloves, dish scrapers, electrical cable and gasoline pump hose.

Similar demonstrations are given in other sections of the DuPont exhibit on the manufacture and use of nylon textile fibers, "Acele" acetate rayon, ceramic colors, paints, and dozens of other DuPont products. Of special interest to the rubber industry, is the presentation of new rubber-coated fabrics for motor car and furniture upholsteries, with data indicating that these materials have a greater durability than any other known fabrics. Also, a wholly new use of rubber in carpets is suggested in a section of the building which is rubber-carpeted, experimentally, to permit chemists to judge the wearing qualities of the material under the tramp of tens of thousands of feet during the months at the Fair.

Leaving the main exhibit hall, the visitor enters a spacious room in the center of the building. In this room is summed up the story of chemical research and discovery in terms of everyday use. Around the curving wall of the room is a series of five stages on which marionettes present various phases of a day in the life of a young couple, indicating how chemistry has contributed to their well-being. Dramatized versions of chemistry's service role in the home, in transportation, in the realm of fashion, in agriculture, and in the World of Tomorrow are given. Above the stages, murals executed by Pierre Bourdelle in DuPont materials, interpret the respective themes. The DuPont exhibit is one of the most educational and instructive at the Fair.

Ford Motor Company Exhibit

With a length of 520 feet, a width of 420 feet, and a height of 88 feet, the exhibit of the Ford Motor Company, designed by Walter Dorwin Teague, is one of the largest at the World's Fair. Located in the Zone of Transportation, it features the "Road of Tomorrow", an elevated highway more than half a mile long rising upon a series of spiral ramps, an entrance hall, an industrial hall, and a broad garden

The Ford Cycle of Production, mounted on a 30-foot high turntable, contains 87 individual displays, many of them featuring animation.

court beautifully landscaped. In the industrial hall is the "Ford Cycle of Production", one of the largest and most complex exhibits ever built.

This unique exhibit, which contains 87 individual displays, 37 car parts and three finished cars, is in the form of a huge turntable, 100 feet in diameter and 30 feet high. Its total weight is 152 tons. The displays and cars on the turntable weigh 29 tons. The entire turntable floats on a hidden pontoon in a circular moat containing 20,000 gallons of water. The moat, which is four feet deep and approximately twelve feet wide, is entirely concealed underneath the turntable. Floating the turntable in water assures silent operation and minimum power requirements.

Since everything that goes into the making of a Ford car came originally from nature, the object of the turntable, or "Cycle of Production", is to convey the vast complexity of production, the network of transportation, and the intricate coordination of activity necessary before the manufactured products can be assembled into an automobile. In all, 142 human and animal figures, in addition to trees, birds, flowers, etc., all uniform in style, workmanship and finish, 79 of which are animated, are mounted on the turntable, each operating some piece of machinery or engaged in some activity which will eventually lead to the manufacture of some finished product. The various steps, from securing of raw material, through manufacturing processes, to finished product, are depicted in mounting levels on the turntable.

The production of automobile tires is one of the "cycles" demonstrated on the turntable. On the first level is a group of rubber trees, complete to correct cuttings, metal insertions and plastic latex cups. A human figure stands beside the center tree in the act of tapping, one arm moving the knife back and forth as if making a tapping cut. Latex appears to be dripping from the cut into the collecting cup. A spotlight from the tree foliage is on the figure's head. To add realism to the scene, a monkey hangs by his tail from one of the lower limbs of the tree as if to inspect the cup.

To the right of this model is a display showing a typical storage bin at a sulfur mine. The scene consists of pipe depositing liquid sulfur in the center of the bin. One figure stands on a wood retaining wall, while another is in the act of carrying timber across the lower platform. The flow of sulfur is animated as is the man's head carrying timber. The sulfur section is illuminated from within.

Ramps from the lower level of the turntable lead from both the tapping and sulfur storage bin displays to a Banbury mixer model on the succeeding level, indicating that rubber and sulfur meet in the mixing machine. An operator stands at the right in front of the rollers of a mill under the discharge outlet of the Banbury. With a knife in his hands, this figure is seen in the act of making a lateral cut in the rubber on the first roller. The roller nearest the audience revolves slowly, the sulfur mass on top of the rollers vibrates, and the operator's knife arm moves back and forth for effective animation.

A ramp, on which is mounted four miniature plant trucks with sheets of rubber piled on their platforms, leads from the mixer to a tire curing press on the next level. A smiling operator stands beside this press, which is of the dual type, with his thumb and index finger on a lever. As the operator's right hand pulls the lever the top of the mold moves up and back while a simulated tire is pushed up at the rear and into clear view of the audience. When the tire lowers the press closes. The final step in this production cycle is a ramp leading from the tire press to finished Ford cars mounted on top of the giant turntable.

Space limitations prevent a more complete description of the excellent Ford exhibit at the Fair, but it is one of the "must" exhibits. A number of new innovations, never before seen at industrial or educational shows, are presented, such as the first activated mural ever constructed.

PVA Polyvinyl Alcohol

POLYVINYL alcohol, the patents on which are owned by E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, and which is sold by its R. & H. Chemicals Department under the trade name of "PVA," is a synthetic water-soluble resin which is rapidly finding applications in many industries because of several unique properties. In the rubber industry, it is being blended with latex to form emulsions used for specific purposes and also for coating rubber gloves to afford protection from the attack of certain noxious organic liquids. Because of these increasing applications, we are reproducing herewith some data on the general properties of this material taken from a recent R. & H. Technical Bulletin.

PVA is a white to creamy-white powder, odorless and tasteless, with an apparent density of 0.4 to 0.6. It does not melt. With prolonged exposure at temperatures over 100° C. the color will deepen and, if the dry powder is heated in air at temperatures of 135° C. to 160° C. for long periods of time, gradual decomposition will occur. It is entirely practicable and safe to apply PVA, in most cases, at temperatures as high as 155° C. to 160° C.

Polyvinyl alcohol, and its aqueous solutions, are stable over indefinite periods, since it is not attacked by bacteria and only rarely by fungi. The viscosity of a dilute solution of PVA (1 to 5%) remains unchanged while standing at ordinary temperatures and during prolonged heating and stirring. Concentrated solutions, especially of high-viscosity grades, are likely to gel on standing but the original working viscosity can be restored merely by warming the solution to about 70° C. and allowing it to cool back to room temperature.

Superior Film-Forming Power

Polyvinyl alcohol possesses superior film-forming power. Films prepared from aqueous solutions by evaporation of water are colorless, odorless, tasteless, transparent, exceedingly tough, completely unaffected by all oils, greases, fats, hydrocarbons and most of the ordinary organic solvents, and possess a high degree of impermeability to gases such as hydrogen, hydrogen sulfide, carbon disulfide, oxygen, nitrogen, air, etc. These films can be drawn tightly around objects with corners and edges without tearing.

Untreated PVA films swell in contact with cold water but will not dissolve until heated to 70° C. Various methods have been developed to reduce or substantially eliminate the effect of water on films and, therefore, PVA has the important advantage that it can be applied to any given base material from aqueous solutions and yet produce a coating, film, or molded article which is highly resistant to water and, in some cases, actually insoluble in boiling water.

PVA is a powerful adhesive and can be used in aqueous solution either by itself or as an ingredient with other materials in different types of aqueous adhesive compositions.

The dry resin is slightly soluble in a few organic compounds such as polyhydroxy compounds, acid amides, amino-hydroxy compounds, and various derivatives of these materials; for example, glycerin, glycols, formamide and acetamide. This property is shared in general with the films, coatings and molded articles. The dry resin can be mixed with a plasticizer and molded under moderate conditions of temperature and pressure to make rubber-like articles with properties, in general, similar to those of the films. It can also be vulcanized with sulfur or sulfur compounds.

PVA is a stabilizer for certain colloidal systems. It is also an excellent emulsifying agent and can be used successfully in many cases where ordinarily it is difficult to prepare satisfactory emulsions. Certain types of pigments can be effectively dispersed in aqueous solutions of the resin.

Canadian Rubber Industry

THE rubber industry of Canada is of considerable importance in the industrial life of the country. Canada now ranks among the leading countries of the world as a manufacturer of rubber goods. In 1937 Canada was the sixth largest importer of raw rubber in the world, ranking after the United States, the United Kingdom, Japan, Germany, and France.

Establishments manufacturing tires, rubber footwear and other rubber goods numbered fifty in 1937, thirty-two plants being located in Ontario, thirteen in Quebec, two in Manitoba, one in Saskatchewan and two in British Columbia. These plants represented an investment of $37,848,950 in land, buildings, machinery and equipment, and $27,270,262 in working capital, or a total capital investment of $65,119,212. They furnished employment to 13,035 persons who received $14,041,066 in salaries and wages and produced goods valued at $74,263,753 from materials costing $31,126,755.

The Canadian rubber industry is practically confined to the Provinces of Ontario and Quebec. The plants in Ontario employed almost 82 per cent of the capital, 72 per cent of the persons engaged in the industry, and produced over 82 per cent of the entire output. The rubber industry also forms an adjunct of considerable importance to the cotton yarn and cloth industry which supply it with tire fabrics. Besides supplying the domestic market, the industry contributes materially to the export trade of Canada.

The value of production in 1937 was considerably higher than that of the previous year. There was a marked increase in the volume of tires and inner tubes produced while their selling value at the factory was somewhat higher, the value of production rising from $29,134,845 in 1936 to $36,166,784 in 1937. The output of footwear was also higher, the volume increasing from 16,894,251 pairs in 1936 to 17,944,182 pairs in 1937 and the value increasing from $19,273,181 to $21,005,538.

The miscellaneous section of the rubber industry, which includes such products as rubber heels and soles, rubber belting, hose, medical and druggists' supplies, mechanical rubber goods, etc., increased its production from $13,646,782 in 1936 to $17,091,431 in 1937, a gain of over 25 per cent.

For the rubber industry as a whole, there was thus an increase of $12,208,945 in the value of production. There were also increases of 1,154 in the number of persons employed, and $2,087,050 in the amount of salaries and wages paid.

Of the three main classes of products manufactured in this industry in 1937 rubber tires and tubes accounted for $36,166,784, or almost 49 per cent of the total; rubber footwear for $21,005,538, or over 28 per cent; and other rubber goods for the balance of $17,091,431 or 23 per cent. Compared with the previous year, the output of rubber tires and tubes increased in value by $7,031,939 or over 24 per cent; rubber footwear increased by $1,732,357 or over 8 per cent; and other rubber goods increased by $3,444,649 or over 25 per cent.

Growing Use of Rubber in Aviation

A Review of the Role Played by Rubber in Modern Airliners, with Several Predictions of Future Uses

By Ray W. Brown

Aeronautical Tire Sales Manager,
General Tire & Rubber Co.

RUBBER is so essential a part of the modern airplane that it is difficult to realize that in the earlier days of aviation, not so many years ago, rubber was almost an unknown quantity on airplanes. Just as the earliest type of land vehicle was the sledge, without wheels and mounted on runners, so the earliest airplanes also were without tires or wheels, but took off and landed on toboggan-like runners. However, wheels were almost immediately installed.

Early Improvement in Equipment

Wheel undercarriages did not have shock-arresting equipment made of rubber, but the shock-resisting equipment was made of coil springs, which often failed at crucial moments, were heavy and quite generally unsatisfactory. The first improvement, after equipping wheels with tires and spring shock-absorbing equipment, was the landing gear, equipped with rubber shock-cord wrapped around the axle and the axle mounting yokes, which gave considerably softer taxiing qualities and withstood landing shock much better than the older type of equipment.

The shock-cord type of gear remained in almost universal application for a number of years. Rubber discs were used in some instances in place of shock-cord, however, as rubber continued to play a very important part, and remained in an undisputable position as shock-arresting equipment for airplanes until 1925.

The average layman, who starts delving into the various uses of rubber in aeronautics, will be surprised to find how many uses there are for rubber on an airplane. Tires have evolved from the old, high-pressure, small cross-section, large diameter, to low and intermediately low-pressure types with increased cross-sections and lowered diameters. This trend is a natural one, as it followed very much in the footsteps of the evolution of the automobile tire, resulting in better landing and taxiing characteristics in mud, snow and sand.

General Tire entered the aviation picture early in its development and has contributed two outstanding progressive designs of tires which have been accepted as standards by the Army and Navy. The first was the streamline tire, which came along simultaneously with the trend toward increased speed of airplanes. Retractable undercarriages had not yet made their appearance, and every possible means was resorted to in streamlining undercarriages in order to cut down the parasitic drag. General invented and produced the streamline tire which gave a very splendid account of itself and was adopted as standard equipment on all Army and Navy planes.

As the evolution of the undercarriage progressed and retractable landing gears made their appearances, high landing speeds also being necessary, General set about developing an improvement over the original streamline tire. This development resulted in a still wider cross-section tire at the rim base, with a slightly more rounded nose, and somewhat less in diameter in corresponding sizes to the streamline. The development is known as the smooth contour tire and the tire is used on such airplanes as the Douglas DC-4, North American, Curtiss, Seversky and many other high-speed military airplanes, as well as a number of commercial types.

Leaving the landing gear and tires for the moment, one has to but look to the right or left about an airplane and rubber sticks out of almost every nook and corner. Sponge rubber is used extensively in shock-absorbing capacity for radio or to reduce vibration, etc. A highly-specialized rubber plays an important part in the manufacture of de-icing equipment. The cushions and chair-back padding on the modern airliner are of a very special sponge rubber.

Rubber-impregnated fabric is used extensively in the way of cushion covers or clothing and sleeper bags. Even shock-cord of the old original landing-gear type, though of much smaller diameter, is extensively used in keeping articles in the plane in a stationary position or to reduce vibration to a minimum on some particularly special instrument mounting. Because rubber is lighter than most metals and as strong as several metals, it is extensively used for door-knobs and radio control panel knobs. The control column wheels are now made of rubber.

Experiments with Synthetic Rubber

General has carried on a number of experiments with various types of synthetics in connection with fuel tanks, acid containers, etc., one of the very newest developments being rubber-lined conduit brackets which are used to hold in place these various wires or fluid-carrying conduits. All fuel and oil lines use rubber hose joints at regular intervals. One has but to look into the engine nacelle of the modern airplane to see the vast number of places that rubber is used.

Ignition wire is rubber-covered, while rubber grommets are used where moving parts pass through metal walls, etc. Rubber bushings are used where the en-

gines are bolted to their mounts. Rubber shock-pads are used where the engine mount is bolted to the main super-structure of the plane. Throughout the engine itself at various points, rubber washers, cushions and tubing are utilized.

The modern strato liner will use rubber more extensively in attaining hermetically-sealed cabins which are necessary for stratosphere work. The rugs and various utility units in the new airliner use rubber-impregnated fabric, as it is of a greater oil-resisting and wind-wear and moisture-resisting quality.

Extensive development is being carried on by all engine builders to reduce vibration and to control vibration. Among the new developments are rubber-lined or synthetic-lined fuel tanks. The Glenn L. Martin Company of Baltimore has developed this very outstanding unit.

Propeller manufacturers are delving into the possible use of rubber for shock and vibration-resisting qualities, and without rubber, radio would be an impossibility. General has recently contributed to the development of the radio and transmitter-antenna cone in collaboration with the Aeronautical Radio Company at Roosevelt Field, New York. This rubber cone is fastened at the end of the trailing antenna wire and serves as a stabilizing force when the antenna is let out to the service position. It is much lighter than the old type of antenna weight that was carried and does a much better job of stabilizing the antenna wire.

Numerous Other Developments

Pneumatic rubber clutches are another development by General which will be used with increasing rapidity and numbers. Rubber has even found its way into the airplane-brake installation. Not only do rubber tubes carry a hydraulic fluid to the brake at the flexible point but the expanding mechanism of the brake itself is now actuated by a rubber bag in some instances.

Some visionary engineers have ventured so far as to state that even certain control surfaces of an airplane can be most satisfactorily covered with and made in part of rubber and rubberized fabrics. No one knows what the future possibilities of rubber in aviation are, as even the door-mats at most of the terminals are made of rubberized fabric. Even the gang-plank of the modern airliner is rubber-covered. Even the packing around the windows and the doors of the modern airliner is of rubber.

In contemplating the national defense program of our government and the commercial activities which are projected, it is expected that several million dollars' worth of aeronautical rubber equipment will be used. Among those companies which are able to deliver and develop rubber products for aeronautical use, General commands its place in this field. New modern production methods are employed. New and modern developments of fabrics and compounds are constantly being brought along with the development of the aviation industry.

In the matter of production facilities it is well to know that this country is in splendid position, having available resources that can be thrown into high gear on a moment's notice. There is no shortage of resources from which to draw materials from which to build tires, and it is thought this country is in a secure position as to synthetics should it ever be shut off from the world's natural rubber supply.

Rubber has without doubt progressed and kept step with aviation's development. Rubber and its applications will always play a big part in aviation's production field. In short, rubber has gone modern.

Improved Bakelite Matrix Material

DEVELOPED over twenty years ago to meet demands of the bag-making industry which required rubber plates for printing on cloth and paper bags, Bakelite matrix material, manufactured by the Bakelite Corporation, New York City, is a type of

fibre board of very open structure in which a special phenolic resinoid has been incorporated. When placed in contact with a pattern, such as a metal printing plate, and subjected to heat and pressure, it becomes soft. In this plastic condition it readily produces a sharp, clean impression of the original pattern. Further heating renders it permanently hard and infusible, thus producing an ideal matrix for the forming of rubber printing plates.

Continued research has resulted in an improved material which now fulfills more exacting requirements. The new material is aiding the trend toward the use of rubber as a general printing medium in letterpress work since it contributes to greater accuracy in rubber plates. Rubber tint blocks, type work, line cuts, and plates for business forms are now being produced at low cost with Bakelite matrix material. In addition, the material is also finding growing use in the making of matrices for molding various other flat rubber goods, such as floor mats, shoe heels and soles.

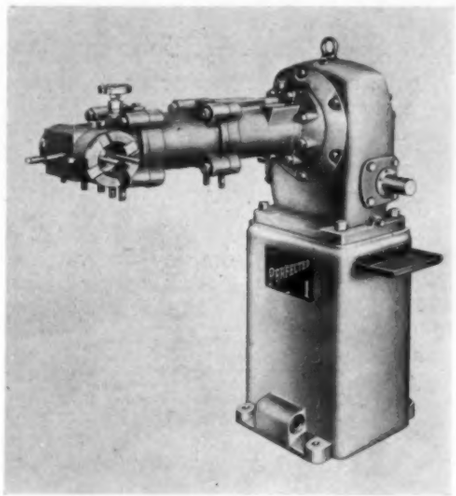
Multipore Porous Rubber Sheet

DEVELOPED many years ago, Multipore porous rubber sheet has been made available for general industrial use by the United States Rubber Company, New York City. The material comes in widths up to 42 inches, lengths to 38 yards, with 1,100 to 6,400 holes per square inch. The holes, or perforations, range in diameters from .004 to .005-inch in the 6,400 hole sheet, and from .010 to .012-inch in the 1,100 hole sheet. Thicknesses range from .030 to .090-inch. The porous sheet is suitable for use in clothing of various types and also for application as a filtering element. A similar rubber sheet with knitted fabric cemented to it is being used for reducing garments. It is made in both a plain style having round holes and in an expanded style in which the holes have been elongated by stretching prior to vulcanization. The numerous holes give ventilation.

New Equipment

Royle Resin Extruding Machines

CONTINUOUS extrusion of resin compounds can now be successfully accomplished through the use of extruding machines developed by John Royle & Sons, Paterson, N. J., using feed screws and die heads substantially the same as those long used for rubber. Leading producers of plastic materials have cooperated with Royle engineers to make suitable machinery for the efficient extrusion of many thermoplastics an actuality. The result of this cooperation has enabled Royle to introduce a number of resin extruding machines featuring a special die head. Royle's screw type extruder, as is well known by this time, consists briefly of a cylinder through which a conveyor screw carries material fed into one end of the cylinder to and through a die at the opposite end. The screw



thoroughly masticates and compresses the compound and the product emerges in continuous lengths, the form of the die determining the shape of the product. The cylinders are step-cored for positive circulation of steam, water or other media used for temperature control. Heads are also cored. For rubber, the machine is furnished with an assembly of valves, on top of the cylinder facing the operator, for controlling the head and cylinder separately. The new resin die head is basically a die-supporting member where the plastic material, having been brought forward through the cylinder by the feed screw, is forced through the forming die. In this head is incorporated adequate passages for the circulation of hot oil and the die-holder is cored to allow temperature control at the very mouth of the die. For use with the resin head, a special jacketed cylinder extension and correspondingly longer feed screw are available to provide a longer compression and heating period for the compound. In covering wire or other forms, the form is introduced into the head at right angles to the cylinder, passing through the head and emerging from the die at the opposite side. The new resin die head is being used with excellent results in the production of resin-covered wire, according to Royle, and its future usefulness is expected to include the continuous extrusion of rods, tubes, channels and other solid or hollow forms.

Safety Carboy Pourer

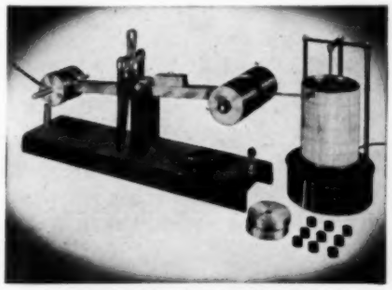
LIGHT in weight and rigidly built, a new safety carboy pourer, which can be easily handled by one man, has been introduced by the Lewis-Shepard Sales Corp., Watertown, Mass. Operation of the pourer, which was developed in cooperation with the Aluminum Corporation of America, is simple. With the carboy resting on its base, the pourer is placed over the top and clamped securely by means of a threaded

Safety Carboy Pourer

handle just below the shoulder. An easy pull on the handle brings the carboy over into pouring position, resting on a broad rocker base. Complete drainage of the carboy is accomplished by pulling the pourer still further until it rests upon the handle. The accompanying illustration shows the carboy in pouring position with the cap removed.

New Rubber Oscillograph

DESIGNED for use in determining certain mechanical properties of rubber and rubber-like materials as vibration absorbers, a new rubber oscillograph has been announced by the American Instrument Co., Silver Spring, Maryland. The new instrument may be used to measure static characteristics, *i.e.*, loading and unloading, creep under a given dead load, and permanent set, as well as dynamic characteristics, *i.e.*, energy absorption during impact loading, resilience,

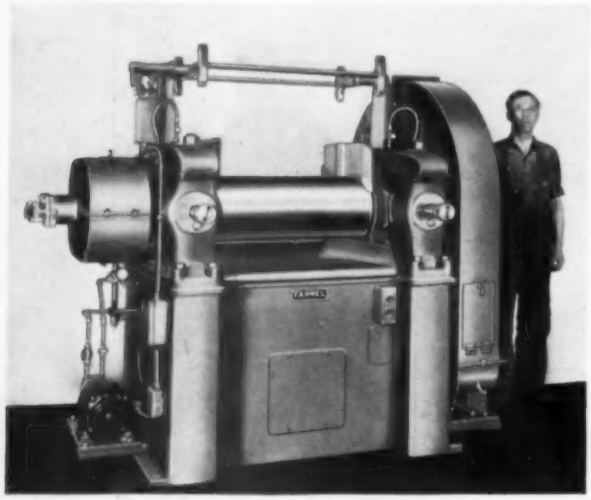


American Rubber Oscillograph

and effective dynamic modulus. The oscillograph is said to be complete in itself and to provide an autographic record in a few minutes from which can be evaluated the properties mentioned above. It can also be used as an auxiliary to a fatigue tester to evaluate a test piece periodically throughout the duration of a life test.

Farrel 12 x 30-Inch Mill

SEVERAL new and advantageous features are said to be incorporated in a new 12 x 30-inch mill for processing rubber and plastics stocks recently built by Farrel-Birmingham Co., Inc., Ansonia, Conn. First, as indicated by the accompanying illustration, the motor and drive are housed inside the high welded steel base. Consequently the mill occupies less floor



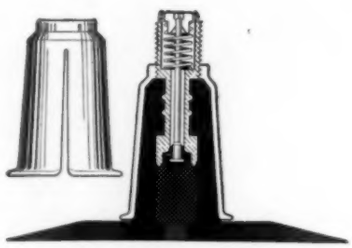
space than the ordinary type of mill which has the motor and drive mounted in line at one end and on the same level. This self-contained feature permits free access to the mill on all sides. The base is the proper working height for safe and convenient operation, as established by safety authorities. It is heat-treated to relieve stresses which may have developed in the process of fabrication and is machined for mounting the mill on top and housing the drive inside. Another feature is the use of flood lubrication by a continuous circulating system to the full circle, bronze-lined journal boxes. An oil sump tank is built as an integral part of the base supporting the mill. The oil flows, by gravity, to the motor-driven pump mounted on the side of the base and is pumped to the four journals, after which it returns by gravity to the pump. Cooling coils can be added to the sump tank to reduce the oil temperature when the mill is used for plastics. The journal boxes are equipped with oil seals to prevent oil leakage. The mill is driven by a 30 h.p. gear-motor with an output speed of 150 r.p.m. The drive gear is Meehanite and the drive pinion and connecting gears are steel, all having machine-cut teeth. They are enclosed in sheet metal guards and run in oil baths. The rolls are chilled iron, fitted with Johnson joints for steam or water circulation. The guides are the self-adjusting type. Safety rods over the rolls operate a brake on the motor for quick stopping in an emergency.

Tag Recorder-Controller

AN economical means for obtaining accurate control of electric furnaces and ovens without the use of rheostats, transformers or other expensive equipment, is said to be provided in a new recorder-controller for throttling electric heat recently developed by the C. J. Tagliabue Mfg. Co., Park and Nostrand Avenues, Brooklyn, N. Y. The instrument has no measurable controller "dead zone" and will hold a steady temperature instead of the oscillating temperature of "on-off" or two-position control. The operation and mechanical construction of the new recorder-controller is similar to the company's familiar line of potentiometers with the exception that by reciprocating the control contacts throttling regulation of electric heat is obtained. When the temperature is far below the desired control point, as for example in starting, the recording carriage indicating the furnace temperature does not engage the reciprocating control mechanism and therefore the power supplied to the furnace is on 100% of the time. The action of the instrument is such that the recording carriage comes to rest in a position which balances the heat input against the heat loss. The throttling zone can be adjusted readily within wide limits and load error kept within a few degrees without introducing appreciable hunting. Adjustment for load error is provided.

New Capless Tire Valve

A NEW capless tire valve, said to completely eliminate the necessity for processed-bonding of the metal valve stem to the rubber base in the inner tube and to feature a new principle of compression air seal with double airlock, thus providing for quicker tire inflation, has been announced by the Ohio Injector Co., Wadsworth, Ohio. The valve, an invention of William F. Goff, is described as being different in both design and construction from any tire valve ever developed. It consists of the usual rubber stem base to be cured into the inner tube, a simplified nickel core, and a highly polished nickel sleeve that mounts over



"Hermetik" Capless Valve

the rubber valve stem and anchors automatically under the tire rim. Not only does this sleeve armor the valve stem, but it becomes a handy utensil for quick and easy extraction of the valve core and for easy injection of a new valve core. The core itself has fewer parts than other valve cores, consisting of a nickel body, rubber-mounted air-lock pin, stainless steel spring, and dirt-excluding spring retainer. The valve core makes its own compression air seal in the valve stem or base, while the sleeve which mounts over the rubber stem and anchors to the rim effects a tight shoulder lock on the nipple-end of the stem and accomplishes the double air-lock. The new OIC "Hermetik" Capless Valve, as it is termed, is fully protected by patents with additional improvement patents pending. The manufacturer is now studying the possibility of using a preshaped uncured stem base which, when developed, will eliminate the necessity of semi-curing, buffing, and cementing the rubber valve stem as is now done generally.

Book Reviews

India Rubber Man. By Ralph F. Wolf. Caxton Printers, Ltd., Caldwell, Idaho. 6x9 in. 291 pp. $3.00.

Written by the co-author of "Rubber, A Story of Glory and Greed," this biography of Charles Goodyear, discoverer of vulcanization, is well-knit and interestingly told. Mr. Wolf has a style all his own and possesses the knack of interpreting facts and figures in such manner that the reader is never bored with them. In many instances, however, the interpretation of comments attributed to Goodyear and the vast army of his co-workers through the years of the middle of the nineteenth century, as well as recordings of certain specific events, differs sharply from those given by P. W. Barker in his biography of Charles Goodyear which ran serially in THE RUBBER AGE from April, 1938, through July, 1939, under the title of "Charles Goodyear—Connecticut Yankee and Rubber Pioneer." For instance, Barker finds humor in one of Goodyear's quotations contained in the inventor's auto-biography "Gum-Elastic" and uses it as an illustration to prove that Goodyear definitely had a sense of humor, while Wolf uses the same quotation to indicate "how humorless a man the inventor was." Nevertheless, "India Rubber Man," which includes a complete bibliography and a subject index, should be read by every member of the rubber industry for its historical value and by those interested in biographies as literature.

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Uses and Applications of Chemicals and Related Materials. Compiled and Edited by Thomas C. Gregory. Reinhold Publishing Corp., 330 West 42nd St., New York City. 6 x 9 in. 653 pp. $10.00.

This book contains surveys on the uses, potential applications and sales possibilities of more than 5,000 chemicals and related materials. These surveys have been appearing in the pages of the *Oil, Paint & Drug Reporter* since 1922, originally under the title "Where You Can Sell," but more recently under "Industrial Uses of Chemicals and Related Materials." The surveys have been rearranged, amplified and completely edited by Mr. Gregory, an expert on chemical marketing, so that the material in its present form represents a mass of information unavailable elsewhere. Among materials presented are inorganic chemicals, organic chemicals, mineral acids, organic acids, fine chemicals, and drug and pharmaceutical products. All products are arranged in strict alphabetical order and not by chemical classification. A list of synonyms and cross references is included.

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Handbook of Chemistry and Physics — 23rd Edition. Edited by Charles D. Hodgman. Chemical Rubber Co., 1900 West 112th St., Cleveland, Ohio. 7⅛ x 4¾ in. 2240 pp. $3.50 (Regular Edition); $6.00 (DeLuxe Edition).

Approximately 400 pages larger than the previous issue, this newest edition of the increasingly valuable Handbook contains a substantial amount of new information concerning compounds already listed and a considerable number of new compounds. The general plan of the book has been retained with minor exceptions. Like previous editions, the latest data available on chemistry, physics, mathematics and related sciences is presented. The 11 sections of the book are divided into the following groupings: Mathematical Tables, Properties and Physical Constants, General Chemical Tables, Specific Gravity and Properties of Matter, Heat, Hygrometric and Barometric Tables, Sound, Electricity and Magnetism, Light, Quantities and Units, and Miscellaneous. A complete subject index is included.

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Let Them Live! By Stewart H. Holbrook. Published by the Macmillan Co., New York City. 5½ x 8 in. 178 pp. $1.50. (Copies available from the National Safety Council, 20 North Wacker Drive, Chicago, Ill., at $1.00 each).

Although this book is primarily a story of industrial accidents, their causes, and the steps which have been and are being taken to prevent them, it is told in so interesting a style that it ranks in reading value with many of the modern novels. Mr. Holbrook, author of "Holy Old Mackinaw," pictures the early days of industry when conditions for workers were almost incredible and then traces the steps taken to eliminate those conditions. He dwells at length on some of the industrial accidents, particularly fires, which have become milestones in the history of industrial safety. This book should be read by all executives concerned with safety in rubber and other factories.

Booklets, Catalogs, etc.

Rubber Industry of the United States—1839-1939. By P. W. Barker. Bureau of Foreign and Domestic Commerce, Washington, D. C. 6 x 9 in. 42 pp. 10c (from Superintendent of Documents, Washington, D. C.).

Issued in commemoration of the 100th anniversary of the discovery of vulcanization by Charles Goodyear in 1839, this booklet traces the birth and development of the American rubber manufacturing industry. Rubber cultivation methods and rubber manufacturing processes are briefly discussed, while the world position of the United States is stressed. One section is devoted completely to statistics, based largely on data made available by the Bureau of the Census through the years. The final section is devoted to the varied uses of rubber, including the importance of the commodity in modern affairs, its versatility and specialized uses. Of special interest is an alphabetic list of rubber products, one of the most comprehensive made available to date. A number of tables showing trends in the rubber industry is also included in the booklet.

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Rubber Producing Companies—1939. Mincing Lane Tea and Rubber Share Brokers' Association, Ltd. Plantation House, Mincing Lane, London, E.C. 3, England. 5½ x 8 in. 580 pp. 8s 1d (approximately $2.00).

The latest edition of this manual gives particulars of approximately 600 rubber-planting companies, including such data as forward sales, capitalization, investments and reserves. A valuable feature is the analyses of results of each company for the past few years. The analyses show estate areas (budded and other), standard outputs, annual production, gross price, "all-in" cost, net profit, dividend and carry-forward. The date of the last reports and annual meetings are also given. The edition has been completely revised.

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Westinghouse-Nuttall Heat-Treated Hardened Gearing. Dept. 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Penna. 8½x11 in. 16 pp.

Characteristics and advantages of heat-treated hardened gears are outlined in this booklet which describes the Westinghouse-Nuttall method of treatment, control and quenching, compares properties of different materials, defines heat treatment and case hardening, and illustrates these discussions by tables, charts, and reproductions of photomicrographs.

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Johnson Friction Clutches. Carlyle Johnson Machine Co., Manchester, Conn. 6¼ x 9¼ in. 10 pp.

The company's standard type of friction clutch with metal-to-metal friction, as well as its super-Johnson type with Raybestos-faced expansion ring, the latter to run dry where such a method of driving is required, are both listed in this new catalog. All recent improvements are also listed, as well as several changes in price. Full specifications are furnished on all types of clutches.

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Okolite. Okonite Company, Passaic, N. J. 8½x11 in.

Data on the application and advantages of Okolite insulated cables for high voltage circuits is given in this booklet. Comparative curves of the operating efficiency, greater load carrying ability and moisture-resistance are shown. Additional data is included on installation methods, tests and available designs.

Editorial Comment

Backlash Legislation

A LESSON is to be learned in the decision of the Colorado Supreme Court that the state's chain store tax should be collected from the Gamble-Skogmo auto accessory stores. The decision holds that although these stores are independently owned they constitute a chain within the meaning of the law because of their common store fronts and the common direction of their merchandising activities by the wholesale supplier. Following Colorado's lead, the attorney-general of Texas has ruled that Firestone must pay the Texas chain store tax on dealers who operate under the Firestone budget plan.

Chain store taxation in the various states was sponsored and clamored for by so-called independents. Many of these independents operate as voluntary chains, that is, the stores are independently owned but purchasing is accomplished through a single wholesaler. The lesson to be learned is that there is an inevitable backlash to regulation legislation and that legal trade barriers, designed to protect sectional position, often accomplish nothing more than adding unnecessarily to the cost of doing business and inviting further government regulation.

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Need for Grading Tires

IT is truly an ill wind that blows nobody some good. A perfect example of this homily is the "50% off" tire sale advertised by several leading tire manufacturers and distributors just prior to the July 4th holiday which aroused the entire tire dealer fraternity to a point where decisive action was taken by Better Business Bureaus, Chambers of Commerce, and other civic organizations concerned with fair play in the business world. In several instances, as related elsewhere in this issue, indictments against the instigators of the advertising were secured.

The cause of the furor was the advertising of second and third-line tires at "50% savings". The reductions, however, were actually nothing like that and represented a saving of 50% only when compared with the cost of first-line tires. Naturally, the great majority of the tire buying public assumed that a general 50% reduction in tire prices had been put into effect and many cases of irate customers or prospective customers were reported by dealers throughout the country.

Where is the good? The advertising served to emphasize the fact that one of the prime causes of misleading or deceptive price comparisons is the system of grading tires. The practice of using second and third-line tires—which may formerly have been first-line—as leaders is nothing new. The tire industry is plagued with perennial "discontinued" lines and with the specious sale-price claims they sometimes father. Maybe the commotion caused by the recent "misleading" advertising will be the spring-board to a system of grading and marking tire lines based on the qualities of materials used in the construction of the tire. Trade cooperation could sire such a system.

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Increase in Shipments

THE decision of the International Rubber Regulation Committee meeting in London late last month to raise the quota for the last quarter of the year to 60% caused no surprise in trade circles, but its action in revising the quota of 55% for the current quarter and raising it to 60% immediately was totally unexpected. There is little doubt but that the 5% increase in immediate permissible shipments may be interpreted to indicate that in the Committee's view the current outlook for rubber justified a 10% increase.

In other words, instead of providing for a large increase in the last or fourth quarter of the year, the Committee has seen fit to spread the extra release over an approximate six-month period. This reasoning is logical in view of the announcement that another meeting will be held early in September should a request be received from the British Government for the release of some 80,000 tons of rubber in connection with the Anglo-United States barter program.

Obviously, if an extra release of rubber for barter purposes was agreed upon it would be undesirable for it to coincide with a 10% increase in the ordinary quota. This possibility is now avoided, for the industry will have adjusted itself before the beginning of the last quarter. Furthermore, no serious difficulties should arise in effecting the increased release in the current quarter. The Committee, therefore, is still displaying its sagacity.

CURRENT • NEWS of the Rubber Industry

AUGUST, 1939

SHIPMENT QUOTAS ARE RAISED TO 60%

Apparently alarmed over the sharp decline in world rubber stocks that has taken place in the past few months, the International Rubber Regulation Committee, meeting in London on July 25, raised the rubber export quota to 60% of basic quotas, effective immediately. The quota increase came as a distinct surprise to the industry which believed that an increase was imminent for the fourth quarter of the year but did not look for any increase during the third quarter, the quota for which was previously set at 55%.

American manufacturers have been advocating an increase in the fourth quarter quota to 65%. The immediate advance from 55 to 60%, which will add approximately 6,000 tons monthly to available supplies, was therefore welcomed in American manufacturing circles because of the fact that it will tend to relieve the supply situation quicker than would have been the case if only the quota for the last quarter was raised, even though it should have been raised to the desired 65%.

Still Some Doubt in Trade

However, there is still some doubt in manufacturing circles whether the immediate increase of 5% will prove sufficient to balance the supply and demand scales, particularly if consumption estimates for the next several months should prove accurate. World consumption for the first five months of the current year averaged 87,000 tons monthly and may easily reach a monthly average of 90,000 tons in the closing months of the year.

Permissible exports from countries signatory to the restriction agreement, excluding exports from Siam and French Indo-China, will amount to 73,225 tons monthly under the new 60% quota. This is, as stated, approximately 6,000 tons more per month than permitted under the 55% quota originally set for the third quarter of the year, and compares with permissible exports of 61,020 tons monthly from the same countries under a 50% quota, which was the maximum allowed during the first half of the current year.

Monthly exports from all agreement territories, including Siam and French Indo-China, both of which receive special treatment under the restriction scheme, will average 81,642 tons during the last six months of the year. This amount will bring total permissible shipments for the entire year of 1939 to 906,478 tons, making for an average of 75,540 tons monthly. Should a still higher quota be put into effect for the October-December period these figures would change accordingly.

Although the International Rubber Regulation Committee was expected to take some action on the question of setting aside a special or supplementary quota to provide the approximately 80,000 tons of crude rubber provided for in the Anglo-United States barter deal of cotton for rubber, none was taken. The Committee did decide, however, that it would reconvene early in September to determine how the barter rubber would be made available, subject to final approval by both the United States Congress and the British Parliament. As yet, the British Government has made no formal application for release of the rubber to the Regulation Committee.

Adopt Rubber Rafts

Rubber life rafts capable of supporting 20 men have been adopted by the Army Air Corps for its large bombers. These rafts were developed at Wright Field, Dayton, Ohio, for use on long sea flights. The rafts, which weigh about 115 pounds each, occupy only three cubic feet of space when folded. Equipped with flares, drinking water, repair kits and four oars, each seats ten persons and has life lines to support an equal number in the water.

Outlaw Defective Tires

A new law passed by the state legislature of Pennsylvania, which becomes effective September 1, makes it unlawful "for any person to operate a vehicle on the highway with tires showing breaker strip, cushion gum or fabric." The law provides severe penalties for anyone operating a car with defective tires. When a state trooper, or other police officer, notifies a motorist that his tires are defective, the motorist has 48 hours to replace the faulty tires. If he fails to do so, he may be fined $10 and costs or be sentenced to five days in jail. According to L. A. McQueen, sales head of the General Tire & Rubber Co., the new state law is a decided step in the direction of greater highway safety.

ORIGINAL TIRE SALES SHOW GAIN OF 105%

An estimated 7,848,000 casings were sold to the automobile manufacturers in the first five months of the current year, representing a gain of 105% over last year's corresponding volume, according to the latest survey of the tire industry conducted by the Poor's Publishing Company. This increase exceeded by a substantial margin the 54% expansion in automobile production, this phenomenon being due to the fact that car manufacturers a year ago were holding tire purchases to a minimum in an attempt to reduce stocks on hand. Excerpts from the survey follow herewith:

With the introduction of new automobiles, scheduled about a month earlier this year, the low point in demand for original equipment tires should be passed about mid-July instead of August or September, as has been the case in recent years. Then, too, the period of low activity will be shorter than average for the automobile industry's model changeover will not take so long as in years when greater style and mechanical innovations have been ventured.

Favorable Factors Are Present

Although it is too early to estimate the demand potentialities for the 1940 models, and consequently for original casings, certain favorable factors are present. Most important, of course, is the improvement in the general business outlook, for this should help clinch many sales that were postponed when economic conditions slackened early this year. It appears now that volume of tire sales will continue sufficiently above the 1938 level to result in a full-year gain of 30 to 35 per cent.

Although the increase in renewal tire sales will not be so large as that expected of the original equipment business, a gain of at least 10 per cent appears certain. Cars turned out in the heavy production years of 1936 and 1937 are reaching the tire replacement stage. Furthermore, total registrations will be the highest on record and these machines will get considerably more use than they did a year ago. Naturally, this will mean a greater demand for renewal tires, which carry a much wider margin of profit than is obtained from original equipment casings.

Manufacturers' sales to wholesalers and retailers totaled 12,924,000 casings during the five months ended with May, 1939, an increase of 33 per cent from the output a year ago.

RECENT TIRE SALES CAUSE TRADE FLURRY

The recent "50% off" tire sales, which were in effect just prior to the July 4th holiday, and which resulted in dealer protests throughout the country, has continued to cause flurries in the trade this past month. Complaints and warnings were issued by Better Business Bureaus in many cities.

The strongest actions taken to date are those occurring in Long Beach, Calif., where a Firestone dealer was cited for violation of the California truth-in-advertising law, and in Columbus, Ohio, where three major tire manufacturers—Goodyear, Goodrich and Firestone—and three large distributors are under grand jury indictment for fraudulent and misleading advertising.

Reason for Commotion

As reported in our previous issue, the cause of the trade excitement was occasioned by the advertising of "50% savings" by the tire manufacturers on second and third-line tires when the actual reductions were nothing like that amount and represented a saving of 50% only when compared with the cost of first-line tires. Most consumers secured the idea that a 50% reduction had been put into effect with considerable confusion resulting.

Recognizing the seriousness of the situation, a group of tire manufacturers held a meeting at Lake Placid, New York, in mid-July, under the auspices of the Rubber Manufacturers Association, and unanimously passed a resolution recording their opposition to any form of misleading advertising. The group also offered its cooperation for the purpose of eliminating misleading statements or implications from advertisements. According to the R.M.A., all manufacturers, distributors and dealers are being asked to cooperate in making the resolution effective and a definite procedure has been established with the object of bringing about a correction of any advertising which is considered to be misleading.

Typical of the actions of Better Business Bureaus throughout the country was that taken by the Better Business Bureau of New York City. H. J. Kenner, general manager of the Bureau, having investigated the claims of price reductions cited in the "50% off" advertisements, finding them to be misleading and unfair, filed his facts with local and federal authorities, and then called a meeting of tire distributors and dealers at the Advertising Club for August 3. The meeting was well attended and as a result of the discussions went on record with the following proposals:

The Recorded Proposals

(1) No statement of representation shall be used in advertising merchandise or prices which has the capacity or tendency to mislead or deceive the consumer. (2) Price claims shall not be used which compare a special sale price of a tire with the list price, or former list price, of a tire of higher price level. (3) Claims of savings based on a manufacturer's list price for any brand and size of tire shall not be used, when the list price is not the price at which such brand and size has usually sold at retail in this community.

These principles have no force of either law or other enforcement, but the group was warned by the Deputy Commissioner of the Department of Markets of New York City, in charge of the Bureau of Weights and Measures, that failure of voluntary efforts to end misleading advertising would result in prosecutions locally by his office. He made the point that the Bureau prefers to have unfair trade practices stopped by voluntary action, but that it has the power to step in where voluntary action is not practiced or is not effective.

Grading Declared Essential

The discussion also developed that one of the causes of misleading or deceptive price comparisons is the system of grading tires. A first quality tire, for example, may be exactly that, but it may also apply to the first quality of the second line of the manufacturer whose brand named is used. The point was raised that manufacturers should grade and mark the lines of tires, based on the qualities of materials used in the construction of the tire, and although no objection was made to the suggestion, no action was taken on it.

George J. Burger, secretary and general manager of the National Association of Independent Tire Dealers, the members of which were instrumental in securing action by the Better Business Bureaus of many cities, was present at the meeting held in New York City and expressed the belief that the daily newspapers could prevent misleading and unfair advertising by closer censorship than that now practiced. The Association recently petitioned the Division of Trade Standards, National Bureau of Standards, Washington, D. C., to institute and arrange for a conference for the purpose of adopting standards for the tire industry.

Coming Events

Sept. 11-13. Electrochemical Society, Hotel Commodore, New York City.

Sept. 13-15. Goodyear Centennial Celebration (in conjunction with 98th Meeting of the A.C.S.), Boston, Mass. (See Page 280, this issue, for complete program).

Oct. 15. 40th National Automobile Show, Grand Central Palace, N. Y.

Oct. 15-17. Nat'l Ass'n of Waste Material Dealers, Fall Convention, Baltimore, Md.

Oct. 16-20. National Safety Congress & Exposition, Atlantic City, N. J.

Dec. 4-9. 17th Exposition of Chemical Industries, Grand Central Palace, N. Y. C.

RUBBER BARTER PLAN NEARS FINAL STEPS

Only the approval of the British Parliament is now needed to complete the details involved in the exchange of 600,000 bales of American cotton for approximately 80,000 tons of British rubber, according to G. E. Rathell, secretary of the Commodity Credit Corporation. Enabling legislation was finally passed by the United States Senate on August 3, just prior to its adjournment.

In approving the barter plan, the Senate assured warehousemen of the interior that they would share in the work and revenue from grading the cotton. A resolution stipulated that cotton be graded at its location at the time the treaty, as it is recognized officially, goes into effect. This departure from the original plan will not seriously affect the agreement in the opinion of Mr. Rathell.

Officials of the Commodity Credit Corporation recently revealed that they are trying to arrange with rubber brokers and manufacturers to exchange stored stocks for fresh rubber to prevent deterioration. Under the terms of the barter plan, the American Government will take title to the rubber in Singapore and must pay transportation charges from that port. The rubber will be stored in this country in Army and Navy warehouses.

Bitter criticism of the United States cotton policy, especially as regards barter agreements with other countries, was expressed by the International Cotton Committee, comprising 30 representatives of 13 countries, meeting in Zurich, Switzerland on August 5. The United States is not a member of the International Cotton Federation but had an unofficial observer at the meeting.

"Air Cell" Developed

A new type of cushioning material, manufactured of latex for use in bus and automobile seats, mattresses and furniture, has been introduced by the B. F. Godorich Co., Akron, under the name of "Air Cell." The new material contains 250,000 air cells to the cubic inch, is porous at the surface to permit free circulation of air, is lighter than ordinary sponge rubber, and may be molded in almost any shape. It may also be used in combination with springs as an elastic covering and tests indicate the air cell construction will last indefinitely in ordinary service. All odor is said to be eliminated from the product.

Now Imperial Rayon Corp.

Stockholders of the New Process Rayon Corp., Gloucester, N. J., on July 19 ratified a change of name of the company to the Imperial Rayon Corp. Paul Zens was continued as president while P. E. Harrison was named vice-president and general manager. Controlling interest in Imperial Rayon, which manufactures rayon cord for tire use among other types, is held by the Edward G. Budd Company of Philadelphia, Penna.

BOSTON RUBBER GROUP HOLDS ANNUAL OUTING

Approximately 175 members and guests attended the annual outing of the Boston Group, Rubber Division, A.C.S., held at the Weston Golf Club, Weston, Mass., on Friday, July 14. The day was devoted completely to fun and frolic with the exception of a short business meeting during which several members were named to the Nominating Committee to select candidates to be voted upon next fall. Golf, tennis, bowling, softball, horseshoe pitching and darts were a few of the sports indulged in by those attending.

Top honors in the various contests included in the golf tournament, always the highlight of the Group's outings, were awarded as follows: *Low Gross for Members*—F. F. Salamon; *Low Gross for Guests*—T. Newman; *High Gross*—H. Atwater; *Low Net*—L. Miller; *Kickers Handicap*—D. W. Ross, A. J. Puschin, A. Perry, F. Ward, F. Downes and E. L. Hanna, all of whom tied; *Most 5's*—Ed Colligan; *Most 7's*—Paul Harriman; *Most 8's*—R. Grant; *Closest to Pin on 11th Hole*—C. Whiteside.

Chairman of the several events were: *Golf*—Ed Colligan; *Darts*—W. C. Weller; *Horseshoe Pitching*—D. D. Wright; *Horse Racing*—Ralph Huber. Lawrence Clarke and Harold Liddick comprised the Prize Committee. Prizes were awarded to all winners in the various events and contests, as well as to holders of lucky number tickets, made possible by the following list of donors:

Advance Solvents and Chemical Corp., L. Albert & Son, Aluminum Flake Co., American Cyanamid & Chemical Corp., American Thread Co., American Zinc Sales Co., Anaconda Sales Co., Atlantic Refining Co., Archer Rubber Co., S. L. Ayres, Barrett Co., Binney & Smith Co., Stewart Bolling & Co., Boston Woven Hose & Rubber Co., Brener & Co., Bristol Co., Brooklyn Color Works, Bryant Electric Co., Godfrey L. Cabot, Inc., Cameron Machine Co., Carter Bell Mfg. Co., Claremont Waste Mfg. Co., Cleveland Liner & Mfg. Co., Colonial Beacon Oil Co., Continental Carbon Co., Davidson Rubber Co., Doe & Ingalls, E. I. du Pont de Nemours & Co., W. D. Egleston Co.

Fisk Rubber Co., Firestone Rubber & Latex Products Co., General Atlas Carbon Co., General Magnesite & Magnesia Co., Grasselli Chemical Co., Gulf Refining Co., C. P. Hall Co., Hird & Conner, Hodgman Rubber Co., Hood Rubber Co., J. M. Huber, Inc., Imperial Paper & Color Corp., Ernest Jacoby & Co., Krebs Pigment & Color Co., Lynch Heel Co., Maintenance Supply Co., Merck & Co., Merrimac Chemical, Monsanto Chemical Co., H. Muehlstein & Co., Naugatuck Chemical, New Jersey Zinc Sales Co., A. C. Nispel, Oakite Products Co., Panther-Panco Rubber Co., Plymouth Cordage Co., Plymouth Rubber Co., Pequanoc Rubber Co.

Raymond Chemical Co., Reichard-Coulston, Inc., John Royle & Sons, Schofield Donald Co., A. Schrader's Son, A. Schulman, Inc., Henry L. Scott Co., Shell Union Oil Co., Sonoco Products Co., Southeastern Clay Co., Stamford Rubber Supply Co., Standard Oil Co., Standard Ultramarine Co., Stanley Chemical Co., Stedfast Rubber Co., Taylor Instrument Companies, Thiokol Corp., Titanium Pigment Corp., Tyer Rubber Co., United Carbon Co., R. T. Vanderbilt Co., Vansul, Inc., Wamsutta Mills, Inc., Webster Cement Co., Weller Chemical Co., Wesco Waterpaints, Inc., L. G. Whittemore, Inc., Wishnick-Tumpeer, Inc., and Xylos Rubber Co.

Firestone Estate Data

According to the Cleveland Trust Company, which filed its trust agreement with the late Harvey S. Firestone, Sr., in probate court on August 5, Mr. Firestone left a gross estate of $2,922,434, which, after deductions of $1,686,089, left a taxable residue of $1,263,345. The estate, largely, was divided equally between the six Firestone children under a trust agreement, while Mrs. Firestone received a life interest in the Akron home, Harbel Manor, and its furnishings. Numerous bequests were made to relatives and friends as well.

Named National Distributors

The Crane Company has been appointed national distributors of the Chiksan line of swing joints, according to an announcement by Earle R. Atkins, sales manager, Chiksan Tool Co., Fullerton, California. The move was made to keep pace with the increasing demand for the company's products, said Mr. Atkins. The Chiksan Tool Co., however, will maintain its staff of sales representatives in principal cities as in the past, and will continue its sales and service organization in the oil fields.

Wingfoot Flooring

A popular priced rubber flooring of top quality, identified as medium gauge Wingfoot Flooring, has been introduced by the Goodyear Tire & Rubber Co., Akron, Ohio. It is being manufactured in rolls of 36-inch width, 40 to 45 yards in length, with a gauge of .095-inch. It is available in seven colors. The new flooring material, which is applied in the same manner as linoleum, is resilient to foot traffic, and is both fire and stain resistant, according to Goodyear.

ACTIVITIES AT BOSTON RUBBER GROUP OUTING

TOP, left to right: Jim Geenty (Sanford Mills), W. O. Hamister (Naugatuck Chemical) and Jack Gilhooley (Sanford Mills), looking them over; Bob Casey (Naugatuck Chemical) gazing at the horizon; Jack Clark (Hood Rubber) returning a fast one. CENTER, left to right: Harold Liddick (Davidson Rubber) and Larry Clark (Haartz-Mason-Grower), two of the Outing Committee members; Jim Walton (Boston Woven Hose) making sure of his distance; Bob Grant, L. W. Miller (Barrett), George Harragan (N. J. Zinc) and R. C. Quortrup (Barrett) staring down the camera. BOTTOM, left to right: Frances Jacoby (Ernest Jacoby & Co.) and George Friedman (Muehlstein) ready for their golf match; Tom Ashley (T. C. Ashley Co.), D. D. Wright (Hood Rubber) and Harry Atwater (Hood Rubber), some more golf geniuses; Al Whorf (Hood Rubber) and Ralph Leighton (Stowe & Woodward) smoking this one out. (All photographs by George Warren Smith).

FINANCIAL NEWS

U. S. RUBBER NETS $4,465,397 IN PERIOD

The United States Rubber Company reports a net profit of $4,465,397 for the first six months of 1939, which compares with a net loss of $239,213 for the corresponding period in the previous year. Net sales for the period totaled $88,359,048, an increase of $20,519,262, or 30% over the same period of 1938.

After providing for six months dividend on the 8% non-cumulative preferred stock, or $2,604,364, there was earned $1,861,033 on the 1,572,261 shares of common stock, equivalent to $1.18 per share. On July 6 last the company's board of directors declared a dividend of $2 per share on the preferred stock from earnings for the year 1939, payable September 22nd to stockholders of record September 8 of this year. In addition, two dividends of $2 each per share, for a total of $2,604,364, were paid in March and June, from earnings of 1938, which completed the total of 8% on the preferred from earnings for that year.

The company's consolidated earned surplus was $5,381,769 on June 30, 1939—after disbursement of March and June preferred dividend payments. Total current assets as of June 30 this year were $91,650,000, in contrast to $86,783,000 for the same period last year. Inventories were down to $51,741,000—from $60,304,000 on June 30, 1938. These included finished goods, goods in process of manufacture, raw materials and supplies; all carried at lower of cost or market price.

During the six months, the interest rate on the company's only indebtedness, the $42,044,000 First Mortgage and Collateral Trust Bonds, was reduced from 4¼% to 3⅝%, effective July 1 of this year. And, in line with the company's policy, four additional subsidiaries were liquidated on or before June 30, 1939.

$3,610,595 IS EARNED BY GOODYEAR TIRE

For the six months ended June 30, 1939, the Goodyear Tire & Rubber Company reports a net profit of $3,610,595, after depreciation, interest, dividends and equity in the undistributed earnings of its subsidiaries which are not wholly owned, Federal income taxes, and other charges. After dividend requirements on 650,432 shares of $5 preferred stock, the profit was equal to 96 cents a share on 2,061,457 common shares, excluding those held in the company's treasury.

The report for the first six months of the current year compares with one of $1,669,828, or 2 cents a share on 2,059,060 common shares, excluding treasury shares, for the corresponding period of the previous year. Net sales for the first six months of 1939 amounted to $95,756,419, as compared with $78,151,636 in the corresponding period of 1938.

Current assets as of June 30, 1939, amounted to $106,409,415, including $21,819,871 in cash and Canadian Government securities, while current liabilities totalled $7,596,480. This compares with current assets of $106,118,140, including $15,779,005 in cash and securities, and current liabilities of $9,206,682, reported at the end of June 30, 1938.

There was no write-down of inventory this year since values are in line with current market prices. The report reveals that regular dividends have been maintained during the period reported on the company's $5 convertible preferred stock and that two dividends of 25 cents per share have been paid on the common stock.

Monsanto Chemical Co.

First Half: Net profit of $2,280,577, equal after provision for preferred dividend requirements and minority interests to $1.60 a share, which compares with $1,224,734, or 85 cents a share, reported for the corresponding period in 1938. Sales for the period were approximately 30% greater than in the first half of the previous year. Net profit for the second quarter amounted to $1,040,678, equal after dividend provisions to 72 cents a share on 1,241,712 common shares, which compares with $555,424, or 37½ cents a share, earned in the second quarter of 1938.

Seiberling Rubber Co.

Eight Months Ended June 30: Net profit of $591,705, before Federal income taxes, which compares with a profit of $33,600 in the corresponding period of the previous year. Net sales for the period amounted to $6,268,478, a gain of 20.8% over the 1938 period. June profit, before taxes, was $106,648, based on the largest June earnings since 1932.

Thermoid Company

First Half: Net profit of $168,733, equal after dividend requirements on 39,956 shares of $10-par, $3-convertible preferred stock outstanding, on which there is an accumulation of unpaid dividends, to 23 cents each on 476,388 shares of $1-par common stock. A net loss of $79,632 was reported in the corresponding period of 1938.

Hewitt Rubber Corp.

First Half: Net profit of $81,053, equal to 48 cents each on 168,188 shares of $5-par common stock, which compares with a net profit of $21,787, or 13 cents a share, reported for the corresponding period of the previous year.

GOODRICH'S PROFIT COMPARES WITH LOSS

The B. F. Goodrich Company reports a consolidated net profit of $3,122,728 for the six months ended June 30, 1939, after provision for depreciation, interest and Federal income taxes, which compares with a net loss of $209,551 reported in the corresponding period of the previous year. The 1939 profit, which includes a non-recurring income of $415,188, is equal to $1.61 a common share after dividend requirements.

Net sales for the first six months of the current year totalled $66,119,599, an increase of 27.4% over the $51,913,986 reported for the same period a year ago. In the 1937 period, Goodrich reported net sales of $78,556,619. The current report shows no write-down for inventory because present values are in line with market prices.

Baldwin Rubber Co.

Second Quarter: Net profit of $28,488, equal to 9 cents each on 316,757 capital shares, which compares with a net profit of $120,559, or 38 cents a share, in the preceding quarter, and a net loss of $17,542 in the corresponding quarter of the previous year. For the nine months ended June 30, 1939, the company reports a net profit of $305,890, or 96 cents a share, against $24,740, or 8 cents a share, for the nine months ended June 30, 1938.

St. Joseph Lead Co.

First Half: Net profit of $1,415,028, equal to 72 cents each on 1,955,680 shares of $10-par capital stock, excluding 41,153 shares held in the company's treasury, which compares with net profit of $46,184, or 2 cents a share, reported for the corresponding period of 1938. Current assets as of June 30, 1939, amounted to $13,481,190, including $4,208,344 in cash, against current liabilities of $1,993,429.

General Cable Corp.

First Half: Net loss of $170,279, which compares with a loss of $326,230 reported for the first half of 1938. For the second quarter of the current year, the company reports a net profit of $26,494, after inventory adjustments, equal to 17 cents each on 150,000 shares of 7% cumulative preferred stock, which compares with a net loss of $196,773 in the preceding quarter and one of $260,083 in the corresponding quarter of 1938.

Anaconda Wire & Cable

Second Quarter: Preliminary report indicates a net profit of $131,293, after obsolescence, equal to 31 cents each on 421,981 capital shares, which compares with a net loss of $77,161 in the preceding quarter and one of $172,343 in the second quarter of 1938.

Names in the News

CHARLES B. O'CONNOR, general sales manager, tire division, B. F. Goodrich Co., Akron, was one of 45 employees completing twenty years of service with the company last month. He will receive his service pin at ceremonies next December.

LESLIE S. GILLETTE, associated with the U. S. Industrial Alcohol Company since 1930 as advertising and sales promotion manager, has resigned to become executive vice-president of the Hazard Advertising Corp. The Hazard agency handles several rubber chemical suppliers including Wishnick-Tumpeer, Continental Carbon, Givaudan - Delawanna, American Cyanamid and General Dyestuff Corp.

JEROME D. KENNEDY, general sales manager, Western Electric Co., retired on August 1 after more than forty years of service with the company. He was honored by friends and associates at a dinner in the Hotel New Yorker in New York City last month.

HAROLD D. ROBISON, trade commissioner at Singapore, Straits Settlement, was a visitor in Akron early this month where he participated in a number of discussions on the crude rubber situation. He has been associated with the U. S. Department of Commerce since 1928.

R. S. WHARTON, formerly general sales manager of the Quaker City Rubber Co., Philadelphia, has been advanced to vice-president in charge of sales. GEORGE C. JOHNSON, formerly manager of the Chicago branch, has succeeded MR. WHARTON as general sales manager.

D. J. HUTCHINS, formerly assistant manager in charge of truck and by-product sales of the Ford Motor Company, has been appointed to the Detroit manufacturers' sales staff of the Firestone Tire & Rubber Co. He will handle all Firestone products, from tires to plastic and steel products.

WILLIAM O'NEIL, president, General Tire & Rubber Co., Akron, was one of three leaders of the rubber industry named by B. C. FORBES, noted financial writer and editor, to select the American citizen who has done most this year to promote industrial labor peace and harmony.

RAYMOND B. SEYMOUR, associated with the Goodyear Tire & Rubber Co. for a number of years, has resigned to join the research staff of the Atlas Mineral Products Co., Mertztown, Penna., where he will be engaged in the development of corrosion-proof construction materials. C. R. PAYNE, in charge of research for Atlas Mineral for the last four years, has been elected a vice-president and director of the company.

A. D. Moss, director of purchases, B. F. Goodrich Co., Akron, reached his fortieth year of service with the company last month. He started in the billing department and was named to his present post in 1920 after having served in several other departments.

ROBERT E. LEE, for the last five years superintendent of the Argentina factory of the Goodyear Tire & Rubber Co. at Buenos Aires, has been made division superintendent at Akron in charge of production at Plant 1. He has been with the company since 1927.

T. SPENCER SHORE, treasurer, General Tire & Rubber Co., Akron, has been elected to the board of directors of the Standard Steel Spring Company of Coraopolis, Penna., manufacturers of automobile bumpers, flat leaf springs, steel gratings and other industrial and automotive products.

W. H. DUNN, comptroller and assistant treasurer of Raybestos-Manhattan, Inc., Passaic, N. J., was elected secretary of the corporation at a meeting of the directorate in New York on July 19. He succeeds the late MORTON F. JUDD.

C. C. WARNER, for the last two years with Dayton Rubber Manufacturing Company as sales promotion manager, has resigned to accept a similar post with the Mansfield Tire & Rubber Co., Mansfield, Ohio. Prior to joining Dayton Rubber, he spent five years with the Seiberling Rubber Co.

JAMES I. SIMPSON, formerly vice-president and general manager of the Dunlop Tire & Rubber Goods Co., Ltd., Toronto, has been elected president of the company succeeding ARTHUR B. PURVIS who continues as vice-chairman of the board. MR. SIMPSON became vice-president and general manager in 1933.

RAY P. DINSMORE, assistant factory manager, Goodyear Tire & Rubber Co., Akron, received his 25-year service pin and a $250 award last month. He has served in four different Goodyear plants since first joining the Akron offices of the company.

ALFRED O. REDLAND, assistant treasurer, Vulcanized Rubber Co., Morrisville, Penna., has been made treasurer of the company succeeding HUGH A. ROSS, recently resigned.

EDWARD V. HEGG, who has been associated with the Buffalo Foundry & Machine Co., Buffalo, N. Y., for more than ten years in various sales and engineering capacities, has been named manager of the company's New York City office.

Exhibitors Increasing

A total of 280 exhibitors have already signed contracts to exhibit at the Seventeenth Exposition of Chemical Industries which will be held the week of December 4 to 9 at the Grand Central Palace in New York City. Over 200 of these exhibitors have participated in previous expositions. Many of them displayed their wares in the first chemical exposition, held in 1915. Since its founding, the Chemical Exposition has been held 16 times and is now established on a biennial basis. This year, more than ever before, the Exposition provides an opportunity not elsewhere available, for studying the latest designs in a vast array of interesting equipment, and for comparing competitive products side by side.

New England

Sumner Simpson, president of Raybestos-Manhattan, Inc., Stratford, Conn., has announced the appointment of Robert B. Davis as general manager, succeeding the late Morton F. Judd. Mr. Davis joined the Raybestos Co. in 1915 as a salesman and was assigned to the New York area. He later became district manager of the New York territory and in 1923 was appointed sales manager of the company.

In 1933, after the merger of Raybestos with the Manhattan Rubber Co., he was named general sales manager in charge of both factory equipment and replacement sales and served in that capacity until his recent promotion. Mr. Davis is also a director of Raybestos-Manhattan, Inc.

Norman Leeds, Jr., former assistant sales manager, has become replacement sales manager, and Sidney E. Shepard, former merchandising manager, is now sales promotion and advertising manager.

Employees of Fisk Rubber Corp., Chicopee Falls, Mass., will receive paid vacations for the first time this summer, because of improved business conditions. Charles E. Speaks, company president, said the vacations would be one or two weeks, depending upon the length of service.

Armstrong Rubber Co., West Haven, Conn., is building a plant addition at 495 Elm street, at a cost of $2,500.

Frederick H. Meyers, 80, former civil engineer and architect who planned the "New Shop" building of the United States Rubber Co. in Naugatuck, Conn., many years ago, died on July 18. After discontinuing his activities as an engineer he was employed by the rubber company for a number of years.

More than 7,000 persons were expected to attend the annual outing of employees of United States Rubber Company, Naugatuck, Conn., on August 12 at Lake Quassapaug, Middlebury, Conn.

Obituaries

John V. Mowe

John Vaughan Mowe, whose association with the tire industry went back to 1905 and who was probably best known for his development and sponsorship of the Fairchild process of manufacturing inner tube molds, died suddenly of heart failure on July 8 while vacationing at North Hero, Vermont. He was 64 years of age.

Born in Oconomowoc, Wisconsin, in 1875, Mr. Mowe received his education in the public schools in that city and in 1901 became associated with the Creamery Package Mfg. Co. of Chicago. A few years later he joined the Henry Knight Co., wholesale wooden ware suppliers, also in Chicago, as a junior partner, retaining that connection until 1905. The following year he entered the tire industry, becoming Detroit branch manager for Firestone, remaining in that post until 1912.

In 1913 and 1914 Mr. Mowe was associated with Goodyear as a special representative, leaving in 1915 to become assistant general sales manager for Kelly-Springfield, later becoming a vice-president, director and general sales manager of that company. He left Kelly-Springfield in 1923 to develop the Fairchild process and formed the Twemo Company to market the new inner tube molds made possible by this process. He was elected president of Twemo in 1925. The patents covering the Fairchild process were long in litigation, particularly in suits brought by Twemo against Goodyear, and even at this date are still not finally adjudicated.

Mr. Mowe was athletically inclined and was a member of both the New York and Detroit Athletic Clubs. Funeral services were held in Crestwood, N. Y., on July 14. He leaves a widow and a son.

Carl Mosier

Carl Mosier, vice-president of the Union Asbestos & Rubber Co., died from a sudden heart attack suffered in Chicago on July 17. He was 51 years of age and had apparently been in good health.

Mr. Mosier was born in Oshkosh, Wisconsin, on April 18, 1888, and received his grammar and high school education in that city. After completing a business course, he entered the employ of the Harriman Lines, in the maintenance and operation department, and served in a clerical position from 1906 to 1911. He then went to New York where he was employed as secretary to the chairman of the board of the Southern Pacific Company, returning to Chicago the following year.

Back in Chicago, Mr. Mosier entered the services of the Illinois Central Railroad as secretary to the president and later occupied a similar position with the Chicago and Alton Railroad. He remained with the latter railroad until 1915, serving for several years as assistant purchasing agent. At the end of 1915 he left the Chicago and Alton to become associated with L. L. Cohen in the formation of the Union Asbestos & Rubber Co. He was made vice-president of the new company, a position he held until his death.

Funeral services were held on July 20 in Oak Park, Illinois, where Mr. Mosier had resided for several years. Interment was in Mt. Carmel Cemetery, Hillside, Ill. He leaves a widow, twin daughters, and a son.

Albert H. Canfield

Albert Homer Canfield, president of the H. O. Canfield Co., rubber manufacturers of Bridgeport, Conn., died at his home in Green Farms, Conn., at the age of 64 on August 3. He was stricken with a heart attack in Florida last winter and had been ill since.

Born in Pekin, Ill., the son of Henry Ogden Canfield, in 1875, Mr. Canfield came to Bridgeport in 1884 when the rubber company bearing the family name was moved to that city from New Brunswick, N. J. He attended Bridgeport schools, Peekskill Military Academy and Cornell University. After being graduated from Cornell he entered the employ of the rubber company and became president in 1910 upon the death of his father.

The Canfield name has been prominent in the American rubber industry for three generations, starting with Jared H. Canfield, grandfather of Albert, who founded the business. The late Albert H. Canfield was the last male member of the family to be associated with the business. A widow and one daughter survive.

John A. Schotta

John A. Schotta, popular member of the engineering staff of the Goodyear Tire & Rubber Company, with which he was associated for 27 years, died at his home, 704 Storer Avenue, in Akron, on August 5, following an illness of three months. He was 48 years of age. Mr. Schotta was born in Catonsville, Maryland, and had resided in Akron for the last 29 years. Shortly after being graduated from Cornell University, he joined the engineering staff of Goodyear and spent 22 of his 27 years of service with the company in the planning division. He was a member of Adoniram Lodge, No. 517, F. & A. M., and Friends of Music, serving as treasurer of the latter organization for 15 years. Funeral services were held in Akron on August 8 with interment in Rose Hill Cemetery. He leaves a widow and daughter.

Franklin R. Johnson

Franklin R. Johnson, advertising manager for the United Shoe Machinery Corp., Boston, Mass., died at his residence, Longwood Towers, Brookline, Mass., after a brief illness on July 19 at the age of 74. He was widely known in the shoe trade, not only for his advertising but equally as well for his merchandising ability.

Mr. Johnson was born in Ansonia, Conn., on October 24, 1864. He received his early education in the local schools and at Russell's Military School in New Haven. His business career began with the Aluminum Brass & Bronze Co., and he was in succession associated with the American Brass Co., the Ansonia O. & C. Co., and the S. O. & C. Company. Through association with the last-named concern, of which he became the corporate head, Mr. Johnson came to the United Shoe Machinery Corporation in 1901 when the company was taken over and made a United Shoe subsidiary.

In addition to his activities with United Shoe, Mr. Johnson had interests in several other fields and at the time of his death he was president of the Aetna Portland Cement Co., director of the What Cheer Mutual Fire Insurance Co., and a trustee of the Brookline (Mass.) Trust Co. His social contacts included membership in the Country Club of Brookline, the Kittansett Club of Marion, the Algonquin Club and the Beacon Society of Boston. Mr. Johnson is survived by his widow and a son.

Walter Goodyear

Walter Goodyear, of 350 West 56th Street, New York City, a grandson of Charles Goodyear, discoverer of vulcanization, the 100th anniversary of which is being commemorated this year, collapsed and died from a heart attack while walking in New York City on July 30. He was 73 years of age. For years Mr. Goodyear ran a bookshop in Times Square but had retired several years ago because of ill health and lately had been living on an old-age pension. He owned several hard rubber relics made by Charles Goodyear, some of which were exhibited in the London and Paris Fairs before the turn of the century. Mr. Goodyear leaves his widow and one son.

Investigation Postponed

In view of the failure of the Interstate Commerce Committee of the House of Representatives to approve the resolution advanced by Representative Martin prior to the adjourning of Congress early this month, the Federal Trade Commission is temporarily stymied in its announced intention to investigate the practices of the tire industry. The resolution, which is termed an outgrowth of the unsuccessful Patman bill to curb manufacturers' sales at retail, was actively promoted by the National Association of Independent Tire Dealers. According to Washington circles, the resolution will receive the Committee's attention early in January.

Los Angeles News

T. Kirk Hill, president of the Kirkhill Rubber Company, reports the largest gross sales in July ever experienced by his company. He stated that advance orders for August indicated that sales for that month would equal those of July. His company has added three new hydraulic presses to take care of growing demands.

F. A. Nied, who has been factory superintendent for Goodrich for some years, will sail for Japan in September where he will be superintendent for the International B. F. Goodrich Company. He has gone to Akron, Ohio, where he is spending a month at the main plant before sailing. Walter E. Head, formerly chief of time study in the tire division at Akron, has been appointed production superintendent for the local Goodrich plant.

Grading, leveling, etc., is practically completed preparatory for the erection of additional warehouse space at the U. S. Rubber Company's plant.

Mike Ryan, well-known chemist connected with the compounding service of Goodyear for many years, has been transferred to Sao Paulo, Brazil, where he will assist in the organization of the company's new plant.

Word received from G. G. Balazs, formerly local chief chemist for Goodyear, who was transferred to England in January, indicates that he is very happily located and enjoying his European experience.

All four major rubber companies report business as good and general employment and production up. One company reports that it is now running at top capacity, six days in the week, 24 hours per day.

The fourth annual fishing trip of the Los Angeles Rubber Group was scheduled to pull out of Wilmington for Catalina Island waters on Saturday morning, August 12, with forty members of the Group, all veterans, aboard. The men were to take dinner at the California Yacht Club in Wilmington the evening before. The good ship *Retreat* was chartered for the trip with comfortable capacity for the 40 men. Lunch aboard was to be furnished by H. M. Royal, Inc. Prizes offered totaled more than $100 in value and were to cover awards in various classifications.

Arrangements were made for moving pictures and these will as usual be shown at the first supper program this fall. W. C. Holmes and W. J. Haney took a heavy part in preparation details. This excursion, now an established annual event, always draws a capacity boat load of fishermen. Most previous trips were out of San Diego harbor but this year the "boys" wanted to stick closer to home, the committee states.

B. F. Benson, chemist in the compounding department at Goodrich, has been transferred to the Akron plant and has been succeeded by M. G. Morgan, formerly of Akron. P. R. Levering has arrived from Akron to take charge of time study in the Los Angeles plant, while D. C. Maddy has also arrived from Akron to take the position of shift supervisor. E. W. Matthis, staff superintendent at Los Angeles, has been transferred to Clarksville, Tennessee, where he will assist in the work of setting up the new mechanical goods plant for the company.

Word from W. J. Voit, head of the W. J. Voit Rubber Corporation, who is making a tour of the world, shows him to be in the Orient. He is looking over the original sources of rubber.

Paul Henry Sullivan, formerly manager of factory accounting for Goodyear in Los Angeles, now secretary and treasurer for the plant in England, spent a few days on the coast in July en route to Akron. Mr. Sullivan has been in England since 1927.

Work is practically complete on the new plant of the Latex Seamless Rubber Company at East Washington and Connor Street. The head of this company is Carl Stentz. Expectations were that operations could begin in the new plant by August 15.

The Los Angeles plant of the United States Rubber Company recently turned out its ten millionth tire for the period which began on January 1, 1931. The occasion was marked by suitable ceremonies. (See accompanying photograph.)

Discusses Compounding

The July-August, 1939, issue of *Vanderbilt News* (Vol. 9, No. 4) is devoted to a discussion of the compounding of rubber. The subject is so treated that it is useful to the beginner and yet helpful to experienced compounders. In turn, results desired, materials available, and methods and specific formulas are effectively treated. The data given is in effect a revision of that which appeared in Vol. 4, No. 6 of the same publication, the supply of which was quickly exhausted. The current issue also includes a short discussion on the compounding of neoprene and "Thiokol." *Vanderbilt News* is the bi-monthly house organ issued by the R. T. Vanderbilt Co., 230 Park Avenue, New York City.

New Glyco Products

Methyl oleate and methyl stearate, both of which find application in the rubber industry as softeners, are now being produced commercially by the Glyco Products Co., Inc., 148 Lafayette St., New York City. These materials, which are insoluble in water and soluble in oils and organic solvents, are said to have created considerable interest because of their special characteristics and application.

Executives of the United States Rubber Company watching the finishing touches being put on the ten millionth tire turned out for the period which began January 1, 1931, at the company's Los Angeles plant. Left to right: C. L. Remy, assistant factory manager; C. J. Ray, assistant general sales manager; Fred O. Carpenter, factory manager; and Paul Gregg, in charge of special brands and automotive sales for the Pacific Coast.

New Rubber Goods

Nairn Treadlite Linoleum

Congoleum-Nairn, Inc., Kearny, N. J., has introduced Nairn Treadlite Linoleum with Built-In Rubber Cushion. The new product is genuine inlaid linoleum

pressed on a fabric backing of waterproofed saturated felt, the combination then being mounted on an adhesive-backed rubber cushion. The rubber cushion, an exclusive, patented feature, prevents the linoleum from opening at the seams whether it is laid with or across the floor boards, prevents splitting as a result of movement of floor boards caused by expansion or contraction, allows the linoleum to be easily removed from the floor if necessary, and makes possible the laying of the linoleum direct to the floor. Twenty-five different style leading colors and designs have been made available.

Colbell Coiled Cords

A line of coiled rubber-covered cords, including heater, electric and telephone cords, has been placed on the market by Colbell Coiled Cords, P. O. Box 225, Santa Monica, California. The cords are seven feet long when extended to full length, but retract to 8½ inches when not in use. The retractile effect is accomplished by a special patented treatment of the outside rubber covering. The heater cord is equipped with a Cutler-Hammer plug while a spring blade feature of the plug prevents it from slipping from the outlet. The cords cannot soil or snag, according to the manufacturer.

Pillow-Mattress Paint

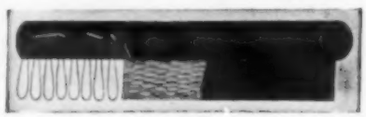
A special vulcanized latex paint for use on pillows and mattresses stuffed with fillings to which some people are allergic, such as cotton, hair, wool, kapok, feathers, etc., is being sold by the Vultex Chemical Company, Cambridge, Mass. The special paint is applied by brushing, drying time generally taking between one and two hours. When properly applied, the paint forms a waterproof film which protects the user of the pillow or mattress by preventing dust from escaping from the fillings to which they are allergic.

Super-Flex V-Belt

A super-flex V-belt made from Daytex Cord has been announced by the Dayton Rubber Mfg. Co., Dayton, Ohio. The cord has improved tensile strength, lower stretch and, due to interlocked fibers, minimum tendency to become lifeless. The V-belt is said to run cooler and to stand up under high speed flexing. In the process of manufacturing Daytex Cord, a bonding-compacting agent removes the non-essential oils and waxes from the outside of the individual fibers causing the fibers to interlock and form a stronger, yet more compact, cord.

Inner-Seal Weather-Strip

Featuring a radically new construction, a new type of weather-stripping has been placed on the market by Bridgeport Fabrics, Inc., Bridgeport, Conn. The new construction consists of a woven spring-wire fabric molded into a sponge rubber rod, thus combining the strength and resiliency of spring steel with the soft sealing action of rubber. The sponge rubber rod permits the strip to conform to in-



tricate shapes, while the spring-wire makes it fit and stay tight. Two styles are being offered by the company, one to truck companies for weather-stripping of doors, and the other for general household use.

Rubatex Frigidette

An ice-cube container, said to be ideal for home or outdoor service, has been introduced by Rubatex Distributors, Inc., 420 Lexington Avenue, New York City. Made of soft molded cell-tite Rubatex (expanded rubber), the Frigidette weighs less than a pound, is 8 inches high and 6 inches in diameter, offers unusual resistance to heat penetration, being ½-inch thick, and holds 24 to 36 ice cubes. It comes equipped with a leak-proof rubber cap which is topped off by a plastic knob. Frigidette is available in a number of color combinations.

Sudbury Transmission Belt

A new round rubber composition belting, with claimed greater pulling power than leather and less subject to stretch, has been announced by the Sudbury Laboratory, South Sudbury, Mass. The new belting is said to be absolutely round, and uniform in quality throughout its length. It is made with a specially constructed flexible core which gives it greater tensile strength, eliminates the necessity of metal fasteners, and contributes to the non-stretching quality of the belting. Machines equipped with the new belting may be driven with less tension, at higher r.p.m., increasing efficiency and saving wear on both bearings and on the belting itself, according to the manufacturer.

Ebonette Household Gloves

A new line of household gloves, under the name of Ebonettes, has been introduced by the Pioneer Rubber Co., Willard, Ohio. Ebonettes, made of neoprene, are guaranteed by the manufacturer to stand up for at least six months in all conceivable types of household liquids. They are unharmed by oils, caustics, cleaning fluids, polishes or harsh soaps. They are said to retain their tailored fit, and will not rot or split. Ebonettes are packed in individual packages, with 12 packages supplied to a display carton.

Kaysam Latex Bulbs

A complete line of ear and ulcer and infant syringes, molded from latex, has been placed on the market by the Kaysam Corporation of America, Passaic, N. J.

Superior aging, flexing and tensile strength are claimed for the new syringes, which have no seams and will withstand high temperature sterilization. The Kaysam syringes are made in a variety of colors and come packed in attractive transparent window containers.

MARKETS

RUBBER—COTTON AND FABRICS—CHEMICALS

NEW YORK, AUGUST 9, 1939

Crude Rubber

CRUDE rubber prices swung in the comparatively narrow range of 42 points in the past month, low for the period being 16.40 for spot on the Exchange on July 12 and high 16.82 on July 18. The advance to the high of 16.82 was due to the publication of favorable consumption figures for June combined with a surge of factory purchasing and orders from London. Withdrawal of factory interest combined with trade uncertainty as to the action of the International Rubber Regulation Committee for permissible shipments under the quota for the fourth quarter of the year resulted in a declining movement from July 19 to July 26. Announcement of an immediate 5% increase in permissible shipments, however, turned the price movement upward, with purchasing by London dealers contributing to the rise. The market was spotty for the next several days with activity centered in futures. No sudden change in the price is anticipated for the next few weeks. Quotations in the outside market, Exchange, London and Singapore, follow:

As of August 9

Plantations—

Ribbed Smoked Sheets—

No. 1 Spot	—	@	.16⅝
October-December	—	@	.16⅞
January-March	—	@	.16⅞
No. 2	—	@	.16⅝
No. 3	—	@	.16½
No. 4	—	@	.16⅜
Thin Latex Crepe	—	@	.18⅛
Thick Latex Crepe	—	@	.18⅛
Brown Crepe, No. 1	—	@	.16¼
Brown Crepe, No. 2	—	@	.16⅛
Amber Crepe, No. 2	—	@	.16¼
Amber Crepe, No. 3	—	@	.16⅛
Brown Crepe, Rolled	—	@	.15

Latex—

Normal, per lb., carload lots	—	@	.20

Paras—

Up-River, fine	—	@	.14¼
Acre Bolivian, fine	—	@	.14⅜

Balata—

Surinam sheet	—	@	.38

LONDON MARKET

Standard Smoked Sheets—Buyers—August 9

October-December	8 5/16	@	8 5/16d
January-March	8 1/16	@	8 1/16d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—August 9

October-December	—	@	8 3/16d
January-March	—	@	8 3/16d

Reclaimed Rubber

Demand for reclaim continued at an even level throughout July with excellent prospects in view for better demand shortly. This optimism is attributed to better conditions in the mechanical goods and insulated wire fields, with tire production maintaining the pace set earlier this year. There has been no change in the price structure since our last report. Current quotations follow:

Shoe

Unwashed, lb.	.06½	@	.06¾
Washed, lb.	.10	@	.10¼

Tube

No. 1 (Floating), lb.	.12	@	.12¼
No. 2 (Compounded), lb.	.08	@	.08¾
Red tube, lb.	.08	@	.08¼

Tires

Black (acid process), lb.	.07	@	.07¼
Black, selected tires, lb.	.06	@	.06¼
Dark Gray, lb.	.09¼	@	.09¾
White, lb.	.11½	@	.12
Truck, Heavy Gravity, lb.	.05½	@	.06
Truck, Light Gravity, lb.	.07	@	.07½

Miscellaneous

Mechanical blends, lb.	.04½	@	.05

Scrap Rubber

(Delivered Akron Mills)

Dealers report a steady demand from the domestic trade and a decided increase in demand from the export trade. The price on auto tire peelings has increased since our last report, while a slight decrease has been made in that for No. 2 inner tube stocks. Current quotations follow:

(Prices to Consumers)

Auto tire peelings, ton	20.00	@	22.00
Mixed auto, ton	12.50	@	13.00
Beadless tires, ton	14.50	@	15.50
Clean solid truck tires, ton	23.00	@	25.00
Boots and shoes, ton	18.50	@	19.50
Arctics, untrimmed, ton	13.00	@	15.00
Inner tubes, No. 1, lb.	.08	@	.09
Inner tubes, No. 2, lb.	.03¾	@	.03⅞
Inner tubes, Red, lb.	.03⅜	@	.03¾

Cotton

Primarily due to uncertainties arising from the cotton export subsidy conference held in Washington, the price of middling uplands on the Cotton Exchange started a declining movement in mid-July which resulted in a drop from 9.89 on July 12, high for the period, to 9.34 on July 20, low for the period. Other factors contributing to the downward movement included large scale profit taking at home and abroad, favorable weather conditions in the South, hedge selling against the new crop, foreign pressure on the near positions, and lack of crop estimates. Announcement of an export subsidy of 1.50 a pound over the July 22nd week-end halted the decline and for the next several days the price moved upwards, reaching 9.81 on August 1. A prediction of a crop of 11,095,000 bales for the season was also instrumental in moving the price into higher channels. Based on renewed uncertainty of the Government's plans for cotton, and conflicting reports from Washington as to the fate of both the Byrnes and Jones bills, the price has sagged in the past few days. Quotations on the Exchange follow:

	July 11	August 9		
	Close	High	Low	Close
October	8.98	8.94	8.87	8.93
December	8.82	8.75	8.68	8.73
March	...	8.52	8.46	8.50

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3, lb.	.28	@	—
Peeler, carded, 23/4/3, lb.	.29	@	—
Peeler, carded, 15/3/3, lb.	.26	@	—
Peeler, carded, 15/4/2, lb.	.26	@	—
Peeler, carded, 13/3/3, lb.	.25	@	—
Peeler, carded, 12/4/2, lb.	.25	@	—
Egyptian, carded, 23/5/3, lb.	.39½	@	—
Egyptian, combed, 25/5/3, lb.	.44½	@	—

CHAFERS

Carded, American, 1 1/16", lb.	.27¼	@	.27½
Carded, American, 1", lb.	17¾	@	.23¼

Sheetings

48x40	36 in.	5.50	lb.	—	@ .04
40x40	36 in.	6.15	lb.	—	@ .03½
40x36	36 in.	6.50	lb.	—	@ .03⅜
48x48	40 in.	2.50	lb.	—	@ .07¾
48x48	40 in.	2.85	lb.	—	@ .06¾
56x60	40 in.	3.60	lb.	—	@ .05¾
48x44	40 in.	3.75	lb.	—	@ .05⅝

Ducks

Enameling (single filling), lb.	.21	@	.23
Belting and Hose, lb.	.25¼	@	—
Single filling, A grade, lb.	.09½	@	.10½
Double filling, lb.	.10½	@	.13½

Closing Rubber Prices on New York Commodity Exchange, Inc.

No. 1 Standard Contract of 10 tons

FROM JULY 12 TO AUGUST 9

Date		Spot	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Sales
July	12	16.40	16.35	16.39	16.44	16.41	16.46	16.50	16.51	16.52	16.53	16.53	16.54	16.55	——	190
	13	16.50	16.40	16.45	16.49	16.50	16.51	16.52	16.54	16.55	16.57	16.58	16.60	16.62	——	206
	14	16.57	16.45	16.48	16.52	16.55	16.58	16.61	16.62	16.62	16.63	16.63	16.64	16.65	——	231
	15	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	16	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	17	16.75	16.64	16.69	16.74	16.76	16.79	16.82	16.82	16.82	16.82	16.83	16.85	16.86	——	295
	18	16.82	16.74	16.79	16.85	16.87	16.89	16.91	16.91	16.91	16.92	16.94	16.96	16.98	——	380
	19	16.75	16.64	16.68	16.72	16.74	16.75	16.77	16.77	16.79	16.82	16.83	16.85	16.87	——	219
	20	16.68	16.61	16.62	16.63	16.65	16.67	16.69	16.69	16.71	16.73	16.75	16.78	16.80	——	172
	21	16.70	16.60	16.63	16.65	16.67	16.69	16.71	16.71	16.73	16.75	16.76	16.77	16.78	——	214
	22	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	23	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	24	16.72	16.63	16.65	16.68	16.70	16.72	16.74	16.74	16.75	16.76	16.78	16.81	16.83	——	50
	25	16.50	16.42	16.45	16.48	16.51	16.54	16.57	16.57	16.57	16.58	16.59	16.60	16.61	——	96
	26	16.48	16.39	16.43	16.47	16.49	16.52	16.55	16.55	16.56	16.57	16.57	16.58	16.59	——	169
	27	16.46	——	16.36	16.40	16.43	16.46	16.49	16.48	16.50	16.51	16.52	16.53	16.54	——	86
	28	16.57	——	16.43	16.47	16.50	16.52	16.54	16.53	16.54	16.57	16.57	16.58	16.59	——	59
	29	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	30	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	31	16.67	——	16.58	16.62	16.65	16.67	16.70	16.69	16.70	16.73	16.73	16.73	16.73	——	129
Aug.	1	16.63	——	16.54	16.58	16.61	16.63	16.66	16.65	16.66	16.68	16.68	16.69	16.69	16.69	76
	2	16.55	——	16.46	16.50	16.53	16.55	16.58	16.57	16.58	16.60	16.61	16.62	16.62	16.62	133
	3	16.60	——	16.51	16.55	16.56	16.59	16.62	16.61	16.63	16.65	16.66	16.67	16.67	16.67	52
	4	16.70	——	16.60	16.64	16.65	16.67	16.72	16.71	16.72	16.73	16.74	16.74	16.75	16.75	199
	5	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	6	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	7	16.71	——	16.62	16.66	16.66	16.69	16.74	16.73	16.74	16.75	16.75	16.76	16.77	16.77	39
	8	16.68	——	16.59	16.63	16.63	16.66	16.71	16.70	16.71	16.72	16.72	16.73	16.74	16.74	65
	9	16.67	——	16.60	16.64	16.64	16.67	16.72	16.73	16.73	16.74	16.74	16.75	16.76	16.76	115

New York
August 11, 1939

Rubber CHEMICAL Markets

All Quotations F.O.B. Works Unless Noted

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.24 @	.30
A-10	lb.	.31 @	.35
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.70 @	.80
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.55 @	.65
Butyl Zimate	lb.	2.50 @	—
Captax	lb.	.50 @	.60
Crylene	lb.	.55 @	.65
paste	lb.	.45 @	.55
Di-Ortho Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.45
El-Sixty	lb.	.50 @	.65
Ethyl Zimate	lb.	2.50 @	—
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.37½ @	.42
Guantal	lb.	.40 @	.50
Heptene	lb.	.35 @	.40
Hexamethylenetetramine	lb.	.33 @	—
Lead Oleate, No. 999	lb.	.14 @	—
Witco		.15 @	—
Lithex	lb.	.18 @	.20
Methylenedianiline	lb.	.36 @	.37
Monex	lb.	— @	2.35
Oxynone	lb.	.64 @	.80
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	2.50 @	—
Pipsolene	lb.	1.55 @	1.85
R & H 40	lb.	.40 @	.41
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-2 Crystals	lb.	2.50 @	2.75
R 28	lb.	.40 @	—
RN-2	lb.	1.40 @	1.80
RN-2 Crystals	lb.	2.00 @	2.25
Rotax	lb.	.60 @	.65
Safex	lb.	1.25 @	1.30
SPDX	lb.	.70 @	.75
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.18 @	.20
Thiocarbanilid, drums	lb.	.24 @	.30
Trimene	lb.	.55 @	.65
base	lb.	1.05 @	1.20
Triphenylguanidine	lb.	.45 @	—
Tuads	lb.	2.35 @	—
Ulto	lb.	1.50 @	1.75
Ureka	lb.	.60 @	.75
Ureka Blend B	lb.	.60 @	.75
Ureka C	lb.	.56 @	.65
Vulcanex	lb.	.42 @	.43
Vulcanol	lb.	.85 @	—
Zimate	lb.	2.35 @	—
Inorganic			
Litharge, domestic	lb.	.07 @	.07½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Compounding Materials)

Blues			
Prussian	lb.	.36 @	.37
Ultramarine	lb.	.15 @	—
Browns			
Mapico	lb.	.13 @	—
Umber, Turkey	lb	.04 @	.04½
Greens			
Chrome	lb.	.21 @	—
Chromium Oxide, bbl.	lb.	.21 @	—
Guignet's Green	lb.	.70 @	—
Reds			
Antimony crimson, 15/17	lb.	.45 @	—
sulfur, free	lb.	.48 @	.60
Indian English	lb.	.09 @	.10
Domestic (Maroon)	lb.	.11 @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red, f.o.b. Easton	lb.	.09¼ @	—
Whites			
Cryptone, No. 19	lb.	.05¼ @	.05½
Cryptone CB, No. 21	lb.	.05¼ @	.05½
Cryptone, ZS-230	lb.	.07½ @	.07¾
Cryptone, ZS-86	lb.	.07½ @	.07¾
Lithopone			
Albalith, black label—11	lb.	.03¾ @	.04
Azolith	lb.	.03¾ @	.04
Ray-bar	lb.	.05⅝ @	.06⅛
Ray-cal	lb.	.05⅝ @	.06⅛
Rayox	lb.	.14 @	.17
Titanox A	lb.	.13 @	.13¾
Titanox B	lb.	.05¼ @	.05½
Titanox C	lb.	.05¼ @	.05½
Zinc Oxide—American Process			
American Azo: ZZZ (lead free)	lb.	.06¼ @	.06½
Anaconda, lead free	lb.	.06¾ @	.06½
Horsehead Lead Free Brand:			
Special—3	lb.	.06¼ @	.06½
XX Red—4	lb.	.06¼ @	.06½
XX Red—72	lb.	.06¼ @	.06½
XX Red—78	lb.	.06¼ @	.06½
XX Red—103	lb.	.06¼ @	.06½
Kadox, black label—15	lb.	.06½ @	.06¾
Blue label—16	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06¼ @	.06½
green label	lb.	.06¼ @	.06½
red label	lb.	.06¼ @	.06½
U. S. P.—7, bbls.	lb.	.09½ @	.09¾
Zinc Oxide—French Process			
Florence White seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07½ @	.07¾
Yellows			
Cadmolith	lb.	.45 @	.50
Chrome	lb.	.14½ @	.15½
Mapico	lb.	.09½ @	—

BLACKS

Arrow "Aerfloted" Specification	lb.	.0275 @	.0625
Bone, powdered	lb.	.05½ @	.14
Carbon, compressed	lb.	.0275 @	.0625
uncompressed	lb.	.0275 @	.0625
"Certified"	lb.	— @	—
"Spherons"	lb.	— @	—
"Disperso"	lb.	.0275 @	.0625
"Excello," compressed	lb.	.0275 @	.0625
"Fumonex"	lb.	.03 @	.05
"Gastex"	lb.	.03 @	.05
Lampblack	lb.	.07 @	.12
"Micronex"	lb.	.0275 @	.0625
"Supreme"	lb.	.0275 @	.0625
Thermatomic—"P 33"	lb.	.04¾ @	.07¾
"Thermax"	lb.	.01¾ @	.05
United "Dixie" & "Kosmos"	lb.	.0275 @	.0625

COMPOUNDING MATERIALS

Aluminum Flake	ton.	21.85 @	24.50
Ammonia carbonate, lump	lb.	.10½ @	.12
Asbestine	ton	13.00 @	15.00
Barium carbonate (98-100%)	ton	— @	—
Barium Dust	lb.	.05 @	.06
Barytes	ton	23.65 @	31.15
Basofor	lb.	.04½ @	—
Bentonite	lb.	.02 @	.03
Blanc fixe dry f.o.b. works	ton	60.00 @	65.00
Calcene	ton	37.50 @	45.00
Cataipo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.40 @	60.00
heavy	ton	45.00 @	55.00
Clay, Kaolin, domestic	ton	7.50 @	15.00
Aerfloted, Suprex	ton	9.50 @	21.00
Congaree	ton	9.50 @	—
Crown (f.o.b. plant)	ton	9.50 @	—
Dixie	ton	11.00 @	26.00
Dixie, Jr.	ton	9.50 @	24.00
McNamee	ton	9.50 @	22.00
Par	ton	9.50 @	22.00
Witco	ton	9.50 @	—
Cotton Flock (Dark)	lb.	.10 @	.12
Glues, extra white	lb.	.18 @	.30
medium white	lb.	.14 @	.19
Kalite No. 1	ton	24.00 @	50.00
Kalite No. 3	ton	34.00 @	60.00
"Lime Crest" Industrial Filler No. 100	lb.	— @	—
Magnesium carbonate	lb.	.07½ @	—
Mica	ton	35.00 @	44.00
Pyrax A	ton	6.00 @	20.00
Rottenstone (powdered)	lb.	.02½ @	.03
Soapstone, powdered	ton	16.00 @	22.00
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00 @	20.00
Whiting, commercial	ton	17.00 @	18.00
Columbia Filler	ton	9.00 @	14.00
English Cliffstone	ton	33.00 @	43.00
Witco	ton	6.00 @	—
Wood Flour	ton	20.00 @	25.00
Zinc Carbonate	lb.	— @	.10¾
Zinc Stearate	lb.	.23 @	—

MINERAL RUBBER

285°-300° Mineral Rubber	ton	22.00 @	42.00
Black Diamond	ton	27.00 @	—
Genasco, solid (factory)	ton	25.00 @	27.00
Hard Hydrocarbon	ton	22.00 @	42.00
Parmr, solid	ton	25.00 @	—
Pioneer, MR, solid	ton		
Pioneer, granulated	ton		

MISCELLANEOUS

Aromatics—Rodo #0	lb.	3.50 @	4.00
Rodo #10	lb.	4.50 @	5.00
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dors No. 5145	lb.	2.00 @	—
Areskleno No. 375 (dispersing, wetting and penetrating agent)	lb.	.35 @	.50
Darvan (dispersing agent)	lb.	.25 @	.47
Santomerse S (dispersing, wetting, penetrating and stabilizing agent)	lb.	.11 @	.25
Sunproof	lb.	.20 @	.25
Sponge Paste	lb.	— @	.18
Tackol (tackifier)	lb.	.085 @	.18
Tonox	lb.	.52 @	.61

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	2.53 @	2.78
Nitric, 36 degrees	cwt.	5.00 @	6.00
Sulfuric, 66 degrees	ton	15.50 @	16.50
Acids, Fatty			
Laurex	lb.	.10½ @	.13
SL #10	lb.	.12 @	.14
Stearex Beads	lb.	.08 @	.09
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10½ @	.11¾
Alkalies			
Caustic Soda, 76%	cwt.	2.70 @	3.55
Soda Ash, 58%, C.L.	cwt.	— @	2.35
Oils			
Cycline Oil	gal.	.14 @	.20
Degras, bbls.	lb.	.07¾ @	.08
Fluxrite	lb.	.05½ @	.06½
Palm Niger	lb.	.05½ @	.06½
Para-Flux	gal.	.17 @	.18
Para Lube	lb.	— @	.05
Petrolatum, light	lb.	.03½ @	.03½
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
Pine, steam distilled	gal.	.64 @	.69
Rosin Oil, cmpd	gal.	.40 @	—
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rubtack	lb.	.08 @	.10
Seedine, c.l.		.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	.07 @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Wobonite, c.l.	lb.	.05 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.05½ @	.06½
coal tar	ton	19.00 @	22.00
hardwood	ton	16.00 @	22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
R. S. L. Resin	lb.	— @	—
Retort Pine Tar, drums	ton	20.00 @	26.00
Solvents			
Acetone, pure	lb.	— @	.06¼
Alcohol, denatured, methanol, No. 1 bbls.	gal.	.33 @	.39
Benzene, 90%	gal.	.18 @	.23
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.50
Carbon, bisulfide	lb.	.05¼ @	.08
Carbon tetrachloride	gal.	.73 @	1.065
Dichlorethylene	lb.	— @	.25
Dipentene, cml., drums	gal	.41 @	.50
Ethylene dichloride	lb.	.05½ @	.06½
Plastogen	lb.	.07¾ @	.12½
Reogen (drums)	lb.	.11½ @	.20
Rub-Sol (f.o.b. Okla.)	gal.	.09 @	—
Trichlorethylene	lb.	— @	.08½
Turpentine, spirits	gal.	.43 @	.47
dest. dist., drums	gal.	.33 @	.41
Waxes			
Beeswax, white	lb.	.39 @	.45
Carnauba, yellow	lb.	.46 @	.47½
Ceresin, white, dom.	lb.	.08 @	.11
Montan, crude	lb.	.10¾ @	.11¾
Paraffin (c.l.—f.o.b. N. Y.)			
Yellow crude scale	lb.	.02¾ @	—
White crude scale 124/126	lb.	.02¾ @	.03
Refined, 122/127	lb.	.04½ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	1.50 @	1.95
Exel	lb.	1.00 @	1.40
Gel	lb.	.57 @	.73
Hipar	lb.	.65 @	.92
Powder	lb.	.52 @	.64
Resin	lb.	.52 @	.64
Resin D	lb.	.52 @	.64
White	lb.	1.25 @	1.60
Albasan	lb.	.70 @	.75
Antox	lb.	.56 @	.58
B-L-E	lb.	.52 @	.61
Flectol B	lb.	.52 @	.65
Flectol H	lb.	.52 @	.65
Flectol White	lb.	.90 @	1.15
Neozone	lb.	.52 @	.63
Oxynone	lb.	.64 @	.80
Retardex	lb.	.35 @	.40
Santoflex B	lb.	.52 @	.65
Santovar A	lb.	1.15 @	1.40
S.C.R.	lb.	.33 @	.35
Stabilite	lb.	.52 @	.54
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.52 @	.61

MOLD LUBRICANTS

Aresklene	lb.	.35 @	.50
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Mold Paste	lb.	.12 @	.18
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rusco, f.o.b. Nitro	lb.	.12 @	.30
Sericite, f.o.b. N. Y.	ton	65.00 @	—
Soap Tree Bark cut sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.17 @	—
Black	lb.	.07 @	.11
White	lb.	.07¾ @	.11
Brown	lb.	.07 @	.09¼
Neophax	lb.	.09¼ @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.07½ @	.15
Sulfur Chloride, yellow (drs.)	lb.	.04 @	—
Sulfur flour, Refined, 100% pure (bags)	cwt.	2.50 @	3.65
Commercial (bags)	cwt.	1.60 @	2.35
Telloy	lb.	1.75 @	—
Vandex	lb.	1.75 @	—

Crude Rubber
Latex and Guayule
Reclaimed Rubber
Tires and Tubes

STATISTICS OF THE INDUSTRY

Rim Production
Automobiles
Gasoline
Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1938	397,620	125,357,730	14.07	5,652	1,799,124	14.21	391,968
1938:							
June	25,983	7,150,115	12.29	399	116,458	13.03	25,584
July	21,771	5,723,381	11.74	420	127,522	13.54	21,351
Aug.	30,798	8,477,231	12.29	432	133,350	13.79	30,366
Sept.	34,383	10,650,107	13.83	803	242,324	13.48	33,580
Oct.	33,449	10,945,896	14.61	621	196,523	14.14	32,828
Nov.	31,903	10,572,345	14.79	415	146,276	15.73	31,488
Dec.	36,031	12,601,926	15.61	424	141,364	14.87	35,607
1939							
Jan.	35,255	12,313,006	15.59	468	165,663	15.79	34,787
Feb.	29,109	10,269,224	15.75	460	152,113	14.76	28,649
Mar.	43,490	15,058,279	15.46	439	171,279	17.43	43,051
Apr.	30,836	10,400,125	15.06	440	151,644	15.38	30,396
May	42,998	15,041,433	15.62	496	180,091	16.20	42,502
June	32,437	11,403,150	15.69	413	147,910	16.00	32,024

* Revised.

Note: "Gross Imports" do not include latex or guayule. To secure more accurate figures for "Net Imports" latex and guayule figures (shown below) should be added and the re-export figure deducted from the total. Annual figures for 1922, however, include both latex and guayule; guayule only is included in 1923. Annual figures for 1922-36 were revised in February, 1937.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule: Tons	Guayule: Dollars	Balata: Tons	Balata: Dollars	Jelutong: Tons	Jelutong: Dollars	Liquid Latex (1): Tons	Liquid Latex (1): Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	....	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1938	2,485	623,819	509	181,140	9,132	2,944,504	11,878	4,147,318
1938:								
June	150	41,518	34	11,496	918	276,126	695	214,420
July	223	49,099	51	16,130	869	267,491	634	209,526
Aug.	250	53,285	41	13,637	526	159,784	876	308,573
Sept.	173	37,954	39	13,896	740	225,161	683	235,242
Oct.	126	27,692	45	20,641	614	163,635	876	347,348
Nov.	59	12,923	66	24,725	307	76,452	1,020	394,082
Dec.	181	39,869	13	6,263	917	237,653	1,263	479,966
1939:								
Jan.	226	49,580	61	20,417	843	203,753	1,602	599,927
Feb.	212	46,576	15	4,426	510	129,726	1,717	657,565
Mar.	229	39,520	14	5,215	641	136,112	2,005	731,302
Apr.	180	24,584	59	18,170	281	72,024	1,018	360,739
May	102	22,347	56	16,359	645	161,745	2,786	1,067,682
June	91	19,879	119	33,876	597	122,087	1,836	694,863

(1) Weight given in pounds of dry rubber contained in latex.

Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Rubber Manufacturers' Association statistics raised to 100 per cent—All figures in long tons)

	Figures on Monthly Basis: 1932*	1933*	1934*	1935*	1936*	1937*	1938*	1939
Jan.	29,648	22,645	39,190	46,636	48,631	50,879	31,265	46,234
Feb.	31,821	21,392	40,515	42,720	36,841	51,950	25,357	42,365
Mar.	29,505	17,843	47,003	42,153	42,813	54,129	32,389	50,165
Apr.	27,518	25,928	44,853	44,247	52,031	51,859	29,730	44,166
May	30,957	44,074	42,918	41,101	50,612	51,795	30,753	44,377
June	41,475	50,743	40,147	36,156	52,772	51,860	32,540	47,259
July	29,976	49,614	32,553	35,917	48,250	43,703	34,219	
Aug.	23,721	44,428	33,216	38,775	46,777	41,506	40,552	
Sept.	23,847	35,281	30,258	37,086	46,449	43,945	40,183	
Oct.	22,286	31,543	31,253	41,969	49,637	38,754	42,850	
Nov.	23,231	28,831	34,748	42,310	50,433	34,025	49,050	
Dec.	18,015	28,757	36,569	42,474	49,754	29,195	48,143	
Tot.	332,000	401,079	453,223	491,544	575,000	543,600	437,031	

* Revised.

Note: All figures are now based on Department of Commerce survey figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks*
1929	218,954	226,588	48.4	27,464
1930	157,967	153,497	40.8	22,000
1931	133,351	124,126	33.9	19,257
1932	75,608	77,504	23.4	16,354
1933	99,560	81,602	19.9	20,746
1934	110,010	100,597	22.2	23,079
1935	122,948	113,078	23.0	25,069
1936	150,571	141,486	24.6	19,000
1937*	185,033	162,000	29.8	28,800
1938*	122,403	120,800	27.6	23,000

Figures on Monthly Basis	Production	Consumption: Tons	Consumption: % to Crude	Stocks*		Production	Consumption: Tons	Consumption: % to Crude	Stocks*
1938:*									
Jan.	8,303	7,463	23.9	28,982	July	7,668	8,777	25.6	18,956
Feb.	6,685	7,679	30.3	27,518	Aug.	11,295	11,387	28.1	18,307
Mar.	7,416	9,109	28.1	25,366	Sept.	12,961	11,969	29.8	18,540
Apr.	6,902	8,043	27.1	23,799	Oct.	14,624	12,522	29.2	19,910
May	7,406	8,613	28.0	22,042	Nov.	15,095	13,440	27.4	21,001
June	8,180	8,779	27.0	20,785	Dec.	15,868	13,019	27.1	23,000
1939:									
Jan.	13,763	13,000	28.1	21,960	July	.....	.....	...	.....
Feb.	13,093	12,626	29.8	21,390	Aug.	.....	.....	...	.....
Mar.	14,528	15,322	30.5	19,955	Sept.	.....	.....	...	.....
Apr.	14,527	13,391	30.3	22,628	Oct.	.....	.....	...	.....
May	14,769	13,517	30.5	22,771	Nov.	.....	.....	...	.....
June	15,871	14,870	31.4	23,058	Dec.	.....	.....	...	.....

* Stocks on hand at the end of month or year.

* Revised.

Note: Figures for 1938 were revised on June 1, 1939, and are now based on Department of Commerce survey figures.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1937*	1938	1939		1937*	1938	1939
January	33,668	35,176	37,847	August	49,598	50,459	.....
February	32,034	31,861	34,595	September	47,515	46,058	.....
March	40,524	41,259	42,520	October	45,446	46,272	.....
April	43,461	43,254	43,977	November	42,718	44,991	.....
May	45,407	44,911	49,547	December	39,465	41,649	.....
June	48,447	48,293	49,812				
July	51,069	47,474	.....	Total	519,352	521,657	.....

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1927	19,700,003	1931	11,253,800	1935	18,664,356
1928	24,247,282	1932	6,261,336	1936	20,790,192
1929	24,141,502	1933	8,713,962	1937	22,257,964
1930	17,364,096	1934	12,255,118	1938	10,612,138

1939		1939		1939	
January ...	1,714,137	May	1,243,519	September .	.....
February ..	1,442,535	June	1,019,626	October ...	.....
March	1,730,211	July	681,434	November .	.....
April	1,348,335	August	.....	December .	.....

ADVERTISING PAGES REMOVED

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market. in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1937																																
April	26⅞	26⅜	26⅞	21⅞	23⅝	24⅞	24⅞	24⅝	24⅝	24⅞	23⅝	23⅞	23⅝	22⅝	22⅝	22⅝	22⅝	20⅛	22⅞	22⅞	23⅛	23⅛		23⅜	20⅝	22⅛	22⅜	20⅛	20⅞			23⅛
May	21	21	21	19⅛	21⅝	21⅜	21⅜	22⅝	22⅝	21⅝	21⅝	21⅝	21⅝	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	21⅛	21⅛		21⅛	19⅞	20⅜	20⅜	19⅛	19⅞			21⅛
June	20⅛	20⅛	19⅞	19⅛	19⅞	19⅞	18⅞	19⅞	18⅞	18⅞	18⅞	18⅞	19	18⅞	19⅛	19⅛	19⅛	19⅛	18⅞	18⅞	19⅛	19⅛		19⅛	19⅛	18⅞	18⅞	18⅛	18⅛			19⅛
July	19⅝	19⅝	18⅞	18⅝	18⅛	18⅛	18⅛	18⅛	19⅛	18⅛	18⅛	18⅛	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝	18⅝		18⅝	18⅝	18⅛	18⅛	18⅛	18⅛			18⅝
Aug.	18⅝	18⅛	18⅞	17⅝	17⅛	17	16⅞	16⅝	16⅝	16⅝	16⅝	16⅝	15⅞	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝		15⅝	15⅝	15⅝	14⅝	18	17⅝			16¼
Sept.	17⅝	17⅝	17⅝	16⅛	16⅛	16⅛	16⅛	16⅛	16⅝	16⅝	16⅝	16⅝	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛		16⅛	15⅝	15⅝	15⅝	15⅝	15⅝			16¼
Oct.	16⅛	16⅛	16⅛	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞	14⅞		14⅞	14⅞	14⅞	14⅞	14⅞	14⅞			14⅞
Nov.	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛		15⅛	15⅛	15⅛	15⅛	15⅛	15⅛			15⅛
Dec.	15	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛		15⅛	15⅛	15⅛	15⅛	15⅛	15⅛			15⅛
1938																																
Jan.	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜		14⅜	14⅜	14⅜	14⅜	14⅜	14⅜			14⅜
Feb.	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜		14⅜	14⅜	14⅜	14⅜	14⅜	14⅜			14⅜
Mar.	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜	14⅜		14⅜	14⅜	14⅜	14⅜	14⅜	14⅜			14⅜
April	10⅞	10⅞	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜		11⅜	11⅜	11⅜	11⅜	11⅜	11⅜			11⅜
May	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜		11⅜	11⅜	11⅜	11⅜	11⅜	11⅜			11⅜
June	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜		11⅜	11⅜	11⅜	11⅜	11⅜	11⅜			11⅜
July	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜		15⅜	15⅜	15⅜	15⅜	15⅜	15⅜			15⅜
August	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛		15⅛	15⅛	15⅛	15⅛	15⅛	15⅛			15⅛
Sept.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛		16⅛	16⅛	16⅛	16⅛	16⅛	16⅛			16⅛
Oct.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛		16⅛	16⅛	16⅛	16⅛	16⅛	16⅛			16⅛
Nov.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛		16⅛	16⅛	16⅛	16⅛	16⅛	16⅛			16⅛
Dec.	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝		15⅝	15⅝	15⅝	15⅝	15⅝	15⅝			15⅝
1939																																
Jan.	16⅛	15⅝	16⅛	16⅛	16	16	16	15⅞	15⅞	16	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞	15⅞		15⅞	15⅞	15⅞	15⅞	15⅞	15⅞			15⅞
Feb.	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝	15⅝		15⅝	15⅝	15⅝	15⅝	15⅝	15⅝			15⅝
March	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛		16⅛	16⅛	16⅛	16⅛	16⅛	16⅛			16⅛
April	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜		15⅜	15⅜	15⅜	15⅜	15⅜	15⅜			15⅜
May	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛		15⅛	15⅛	15⅛	15⅛	15⅛	15⅛			15⅛
June	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜		16⅜	16⅜	16⅜	16⅜	16⅜	16⅜			16⅜
July	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞		16⅞	16⅞	16⅞	16⅞	16⅞	16⅞			16⅞
August	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞	16⅞		16⅞	16⅞	16⅞	16⅞	16⅞	16⅞			16⅞

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Markets)

Average Price per Pound for Years 1911-1931

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1912	121.60	1916	72.50	1920	36.30	1924	26.20	1928	22.48
1913	82.04	1917	72.23	1921	16.36	1925	72.46	1929	20.55
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98
1915	65.85	1919	48.70	1923	29.45	1927	37.72	1931	6.17

Average Monthly Price per Pound Since 1932

	1932 Cents	1933 Cents	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents	1939 Cents
Jan.	4.38	3.08	9.32	13.10	14.35	21.37	14.63	15.75
Feb.	4.03	2.95	10.45	12.92	15.48	21.33	14.71	15.93
Mar.	3.35	3.01	11.01	11.51	15.89	24.09	13.55	16.26
Apr.	3.02	3.56	12.10	11.55	15.98	23.44	11.84	15.87
May	3.09	4.95	13.26	12.05	15.62	21.14	11.57	16.07
June	2.66	6.15	13.51	12.57	15.85	19.29	12.57	16.37
July	2.89	8.01	14.60	12.10	16.49	18.86	15.37	16.51
Aug.	3.63	7.31	15.47	11.98	16.25	18.37	16.08	
Sept.	3.84	7.30	15.36	11.55	16.46	18.55	16.15	
Oct.	3.65	7.64	13.96	12.62	16.55	16.28	16.89	
Nov.	3.44	8.66	13.04	13.15	17.97	14.60	16.24	
Dec.	3.24	8.87	12.98	13.28	20.01	15.41	16.05	
Average for Year	3.49	5.96	12.92	12.37	16.41	19.39	14.64	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1939 May	1939 June	1939 July	1939 Aug.	Day	1939 May	1939 June	1939 July	1939 Aug.
1	7 7/8	8 1/8	——	8 7/8	17	8	——	8 5/8	
2	7 7/8	8 1/4	——	8 3/4	18	8	——	8 3/4	
3	7 7/8	——	8 3/8	8 7/8	19	8	8 3/8	8 1/8	
4	7 7/8	——	8 3/8	8 1/2	20	——	8 3/8	8 1/8	
5	7 7/8	8 1/4	8 3/8	——	21	——	8 3/8	8 3/4	
6	7 7/8	8 1/8	8 3/8	——	22	8	8 1/8	——	
7	——	8 1/4	8 3/8	——	23	8 1/8	8 1/8	——	
8	7 7/8	8 1/4	——	8 1/2	24	8 1/8	——	8 3/4	
9	7 7/8	8 1/4	——	8 1/2	25	8 1/4	——	8 1/8	
10	8	——	8 3/8		26	8 1/4	8 1/4	8 1/8	
11	7 7/8	——	8 3/8		27	——	8 1/4	8 1/8	
12	7 7/8	8 1/8	8 3/8		28	——	8 1/8	8 3/4	
13	——	8 1/8	8 3/8		29	——	8 1/8	——	
14	——	8 1/8	8 3/8		30	——	8 1/8	——	
15	7 7/8	8 1/8	——		31	8 1/8	——	8 1/8	
16	8	8 1/8	——						

Average Monthly Price Per Pound

Month	1936 Pence	1937 Pence	1938 Pence	1939 Pence	Month	1936 Pence	1937 Pence	1938 Pence	1939 Pence
Jan.	6.758	10.378	7.077	7.926	Aug.	7.581	8.830	7.841	
Feb.	7.255	10.503	7.029	7.942	Sept.	7.577	8.935	7.918	
Mar.	7.450	11.766	6.590	8.120	Oct.	7.898	7.855	8.355	
Apr.	7.502	11.471	5.793	7.910	Nov.	8.572	7.080	8.111	
May	7.335	10.250	5.632	8.002	Dec.	9.580	7.332	8.005	
June	7.352	9.548	6.147	8.216	Average for Year	7.713	9.424	7.164	
July	7.696	9.136	7.464	8.271					

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1939 June	1939 July	1939 Aug.	Date	1939 June	1939 July	1939 Aug.	Date	1939 June	1939 July	1939 Aug.
1	9.70	9.75	9.81	11	——	9.98		22	9.90	9.44	
2	9.78	——	9.69	12	9.89	9.89		23	9.97	——	
3	9.78	9.87	9.64	13	9.92	9.85		24	9.91	9.54	
4	——	——	9.55	14	9.97	9.77		25	——	9.68	
5	9.92	9.82	9.55	15	9.87	9.69		26	9.91	9.75	
6	9.82	9.83	——	16	9.86	——		27	9.97	9.68	
7	9.91	9.96	9.60	17	9.87	9.58		28	9.83	9.58	
8	10.00	9.87	9.47	18	——	9.39		29	9.83	9.65	
9	9.99	——	9.53	19	9.91	9.49		30	9.71	——	
10	9.98	10.02		20	9.86	9.34		31	——	9.78	
				21	9.87	9.44					

Average Monthly Price Per Pound

	1936 Cents	1937 Cents	1938 Cents	1939 Cents		1936 Cents	1937 Cents	1938 Cents	1939 Cents
Jan.	11.91	13.06	8.57	8.94	Aug.	12.28	10.41	8.41	
Feb.	11.53	13.15	8.91	8.97	Sept.	12.31	9.02	8.17	
Mar.	11.43	14.46	8.92	9.00	Oct.	12.30	8.42	8.61	
Apr.	11.71	14.23	8.76	8.87	Nov.	12.23	7.96	9.08	
May	11.68	13.34	8.50	9.56	Dec.	12.83	8.26	8.72	
June	12.02	12.70	8.38	9.88	Average for Year	12.11	11.44	8.66	
July	13.11	12.26	8.85	9.71					

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of:	ON HAND 1937	ON HAND 1938*	ON HAND 1939	AFLOAT 1937	AFLOAT 1938	AFLOAT 1939	ON HAND AND AFLOAT 1937	ON HAND AND AFLOAT 1938*	ON HAND AND AFLOAT 1939
Jan.	204,436	276,497	237,826	55,096	57,356	48,210	259,532	333,853	286,036
Feb.	195,692	292,067	231,475	53,538	47,459	55,814	249,230	339,526	287,289
Mar.	192,980	301,762	205,936	56,994	41,882	55,981	249,974	343,644	261,917
Apr.	176,289	303,901	190,896	72,530	39,071	57,918	248,819	342,972	248,814
May	175,273	300,907	193,602	58,542	32,859	54,046	233,815	333,766	247,648
June	172,056	294,796	181,794	57,215	32,079	51,274	229,271	326,875	233,068
July	167,094	282,785		75,779	40,400		242,873	323,185	
Aug.	174,195	273,841		80,439	47,772		254,634	321,613	
Sept.	186,193	268,094		83,288	48,927		269,481	317,021	
Oct.	200,025	259,074		80,653	50,162		280,678	310,136	
Nov.	222,707	242,592		81,302	51,114		304,009	293,706	
Dec.	262,204	231,500		63,099	45,105		325,303	276,605	

* Revised.

STOCKS IN GREAT BRITAIN

(No. of Tons in Wharves and Warehouses, not including Latex)

At end of	London 1937	London 1938	London 1939	Liverpool 1937	Liverpool 1938	Liverpool 1939
January	29,005	40,203	51,420	41,895	21,711	28,789
February	26,508	46,596	48,312	37,078	24,737	26,784
March	21,292	50,233	46,768	30,622	26,220	24,996
April	21,128	54,296	44,760	27,443	28,277	23,742
May	21,351	57,194	43,454	25,081	29,862	22,211
June	21,964	60,307	42,374	21,258	31,837	21,176
July	22,589	62,236		19,424	32,825	
August	25,211	65,113		19,817	34,315	
September	28,462	63,321		21,190	34,645	
October	30,465	59,609		21,327	33,483	
November	33,304	57,794		21,399	32,116	
December	35,633	55,668		21,978	31,012	

(Figures from the Rubber Trade Association of London)

STOCKS IN OTHER CENTRES

(Figures from Statistical Bulletin of the Int'l Rubber Regulation Committee)

	Penang and Singapore [1]	Malaya [2]	Ceylon [2]	Holland	Para and Manaos
At end of 1938					
June	44,729	49,290	4,488	190	904*
July	45,529	52,081	5,014	711	944
August	41,002	49,922	4,659	672	1,032
September	35,386	53,815	5,339	662	1,599
October	34,901	54,720	4,916	669	1,796*
November	31,255	54,283	4,409	349	2,267
December	27,084	57,800	6,120	268	1,864
At end of 1939					
January	30,975	59,155	4,827	198	1,557
February	28,559	59,399	4,318	183	1,826
March	23,255	58,005	3,389	137	2,244*
April	22,434	55,238	3,648	131	2,209
May	20,849	53,434	4,005		1,966

[1] Dealers' and Port Stocks. [2] Inside Regulated Areas. [3] Dealers' Stocks Only.
* Revised.

RUBBER STOCKS AFLOAT

End of:	Afloat for United States	Afloat for Europe	All Other * Afloat	Total * Afloat
1938				
May	32,859	40,600	20,541	94,000
June	32,079	42,580	17,341	92,000
July	40,400	39,150	25,450	105,000
August	47,772	34,500	18,728	101,000
September	48,927	29,200	17,873	96,000
October	51,062	26,100	21,838	99,000
November	51,114	26,700	14,186	92,000
December	45,105	26,800	8,095	80,000
1939				
January	48,210	27,900	28,890	105,000
February	55,814	28,300	21,886	106,000
March	55,981	25,200	20,819	102,000
April	57,918	27,200	13,882	99,000
May	54,046	25,000	16,954	96,000
June	51,274	20,000	16,726	88,000

* *Total Afloat* is an arbitrary estimate based on 1½ months' shipments as adopted by the Department of Commerce. *All Other Afloat* is determined by subtracting the amount of stocks in transit to the United States and Europe from the estimated total.
P—Preliminary estimate.

TOTAL PRINCIPAL WORLD STOCKS

(Figures from the Survey of Current Business)

At End of:	1934	1935	1936	1937*	1938*	1939
January	661,948	698,153	600,479	454,249	549,762	497,665
February	663,308	686,195	599,355	445,265	565,833	479,578
March	666,382	678,809	583,318	447,856	586,666	460,723
April	658,796	677,006	567,172	428,249	586,291	438,252
May	689,239	677,569	541,871	413,134	568,158	429,979
June	672,804	671,525	520,255	434,250	573,136	407,640
July	676,200	679,061	519,074	445,782	580,654	.....
August	674,702	680,644	500,520	457,462	565,394	.....
September	694,361	661,509	493,585	470,768	551,447	.....
October	680,616	655,000	486,159	479,398	540,976	.....
November	684,408	617,300	466,491	493,266	512,196	.....
December	705,975	613,987	466,576	545,533	482,852	.....
Monthly Avge.	677,395	666,397	528,738	460,022	555,280	.....

* Revised.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis

Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	11,004	6,635	13,437	13,355	11,376	15,565	7,532	13,702*
Apr.-June	12,980	14,412	13,565	12,597	14,892	15,834	8,353	13,466
July-Sept.	9,245	14,707	9,822	11,312	14,914	12,207	11,240	
Oct.-Dec.	6,856	9,550	10,406	12,099	14,858	9,704	13,052	
Total	40,085	45,304	47,230	49,363	56,040	53,310	40,182	

Shipment Figures on Quarterly Basis

Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	8,760	6,981	10,730	11,154	10,554	14,143	7,534	12,156*
Apr.-June	18,021	15,139	14,998	13,473	15,940	15,741	10,363	14,842
July-Sept.	8,141	13,707	11,648	13,489	14,037	13,106	11,748	
Oct.-Dec.	5,329	8,265	9,310	12,066	12,855	10,495	12,685	
Total	40,251	44,092	46,686	50,182	53,386	53,485	42,330	

Inventory Figures [2]

Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	9,878	7,290	11,651	11,675	8,762	12,004	10,521	10,248*
Apr.-June	4,999	6,615	10,219	10,755	7,556	12,081	8,470	8,804
July-Sept.	6,096	7,595	8,419	8,288	8,690	11,200	8,022	
Oct.-Dec.	7,644	8,888	9,455	8,196	10,717	10,383	8,451	

Figures for Recent Months

	PRODUCTION 1937	PRODUCTION 1938	PRODUCTION 1939	SHIPMENTS 1937	SHIPMENTS 1938	SHIPMENTS 1939	INVENTORY [2] 1937	INVENTORY [2] 1938	INVENTORY [2] 1939
Apr.	5,525	2,660	4,211	5,362	3,143	4,356	12,178	10,141	9,998
May	5,161	2,663	4,418	5,183	3,291	4,753	12,142	9,521	9,919
June	5,149	3,036	4,837	5,197	3,929	5,733	12,081	8,470	8,804

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis

Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	10,721	6,230	12,823	12,553	11,891	15,831	7,314	12,385*
Apr.-June	11,913	13,001	13,191	11,631	14,624	15,413	7,380	11,938
July-Sept.	8,286	14,356	10,321	11,270	15,320	12,038	10,794	
Oct.-Dec.	5,970	9,000	9,891	12,425	15,201	9,092	12,360	
Total	36,890	42,587	46,226	47,879	57,036	52,374	37,848	

Shipment Figures on Quarterly Basis

Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	8,918	6,539	10,640	11,252	11,367	14,606	7,387	11,371*
Apr.-June	16,271	13,292	14,553	11,928	15,113	15,495	9,564	13,147
July-Sept.	7,761	13,370	11,545	13,251	15,069	12,901	11,243	
Oct.-Dec.	4,961	8,189	8,306	11,636	12,874	9,765	12,099	
Total	37,911	41,390	45,044	48,067	54,423	52,767	40,239	

Inventory Figures [2]

Quarter	1932	1933	1934	1935	1936*	1937*	1938*	1939
Jan.-Mar.	9,448	6,369	10,244	10,406	8,660	11,993	10,547	9,163*
Apr.-June	5,174	6,097	8,795	10,050	8,075	11,833	8,337	7,814
July-Sept.	5,753	7,008	7,639	7,565	8,595	11,326	7,859	
Oct.-Dec.	6,749	7,815	9,180	8,231	10,945	10,312	8,166	

Figures for Recent Months

	PRODUCTION 1937	PRODUCTION 1938	PRODUCTION 1939	SHIPMENTS 1937	SHIPMENTS 1938	SHIPMENTS 1939	INVENTORY [2] 1937	INVENTORY [2] 1938	INVENTORY [2] 1939
Apr.	5,669	2,258	3,841	5,365	2,860	3,927	12,309	9,917	8,837
May	4,993	2,325	3,848	5,066	2,974	4,154	12,197	9,265	8,840
June	4,751	2,797	4,249	5,064	3,730	5,066	11,833	8,337	7,814

[1] Based on reports received from the Rubber Manufacturers Association.
[2] Held by manufacturers at end of period indicated.
* Revised.

Automobile Production

	United States Total	United States Passenger Cars	United States Trucks	Canada Total	Canada Passenger Cars	Canada Trucks	Grand Total
1928	4,357,384	3,826,613	530,771	242,382	196,737	45,645	4,599,944
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933*	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,124
1934*	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935*	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936*	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937*	4,808,974	3,915,889	893,085	207,463	153,046	54,417	5,016,437
1938	2,489,635	2,000,985	488,650	166,142	125,081	41,061	2,655,777
1938*							
Oct.	209,512	187,494	22,018	5,774	5,412	362	215,286
Nov.	372,413	320,344	52,069	17,992	15,423	2,569	390,405
Dec.	388,346	326,006	62,340	18,670	15,518	3,152	407,016
1939							
Jan.	339,152	280,033*	59,119*	14,794	11,404	3,390	353,946
Feb.	297,841	239,980*	57,861*	14,300	10,914	3,386	312,141
Mar.	371,940	299,703	72,237	17,549	12,689	4,860	389,489
Apr.	337,372	273,409	63,963	16,891	12,791	4,100	354,263
May	297,508	237,870	59,638	15,706	11,585	4,121	313,214
June	309,720	246,704	63,016	14,515	10,585	3,930	324,235

* Revised.
Note: U. S. figures represent factory sales; Canadian figures represent production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA [1]								NETHERLAND INDIES [4]						
	Gross Exports	Imports	Net Exports	Ceylon [2]	India & Burma [3]	Sarawak [3]	British North Borneo [3]	Siam [3]	Java & Madura	Sumatra E. Coast	Other N. I.	Indo-China [3]	Amazon Valley	All Other [3]	World Total [6]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	3,067	16,765	7,856	406,41
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,36
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	3,377	46,757	65,499	120,626	7,881	25,298	13,797	514,48
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,53
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,47
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,79
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,89
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,24
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,20
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,345	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	5,551	84,085	139,632	207,863	43,399	15,576	13,063	1,133,864
1938	526,911	156,101	370,810	49,528	15,178	17,792	9,512	41,080	57,526	94,501	145,909	58,518	14,618	12,920	887,892
1938:															
Mar.	49,197	15,813	33,384	3,834	1,235	1,564	853	2,837	5,673	10,156	15,447	3,213	1,831	1,322	81,349
Apr.	53,864	9,158	44,706	1,951	1,327	1,728	1,158	1,583	5,967	10,081	12,434	3,647	1,004	774	86,360
May	38,245	10,325	27,920	2,833	1,470	1,648	815	2,507	4,575	7,515	9,944	3,118	1,053	904	64,302
June	42,258	14,394	27,864	3,693	1,318	2,441	643	3,904	4,519	7,788	12,120	4,776	718	818	70,602
July	43,689	18,713	24,976	3,861	1,083	2,057	937	4,710	6,808	8,271	19,955	5,139	625	1,063	79,485
Aug.	47,246	13,735	33,511	4,401	953	965	728	4,793	4,757	7,339	11,006	3,840	1,050	1,074	74,417
Sept.	40,992	10,586	30,406	3,990	1,036	756	284	3,893	4,026	7,052	9,092	8,139	758	1,292	70,724
Oct.	42,294	16,599	25,695	4,893	1,111	1,612	1,075	4,438	4,486	8,229	17,166	3,638	1,796	1,092	75,231
Nov.	39,340	10,219	29,121	6,422	1,271	929	567	3,223	3,975	5,678	9,568	4,035	1,159	990	66,938
Dec.	32,901	7,607	25,294	3,212	1,586	599	227	3,029	1,873	4,332	4,315	9,815	2,205	1,021	57,508
1939:															
Jan.	43,332	19,049	24,283	7,237	1,879	2,342	1,604	2,918	6,787	11,261	20,630	4,739	1,708	1,200*	86,588
Feb.	43,084	13,889	29,195	5,495	1,565	1,484	664	5,606	4,833	8,410	11,658	5,659	1,056	1,200*	76,825
Mar.	43,259	14,035	29,224	3,718	1,393	1,177	344	5,401	5,361	8,084	14,428	4,636	1,331	1,200*	76,297
Apr.	43,668	13,996	29,672	2,225	1,260	2,446	1,687	2,660	5,321	9,250	13,691	2,581	1,139	1,200*	73,132
May	42,214	12,697	29,517	2,807	1,678	1,649	558	2,782	4,105	8,159	12,009	4,585	874	1,200*	69,923
June	31,541	9,567	21,974	3,641	1,452	1,157	332	1,748	5,839	8,846	12,754	4,630	1,200*	1,200*	64,773
July	45,962	20,052	25,910	4,908											

All figures from January, 1934, onward are net exports shown on a "dry rubber" basis as calculated by the International Rubber Regulation Committee. (1) Prior to January, 1934, Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex also is not included in the early years, which on a dry rubber basis was as follows: 1924—1,117 tons; 1925—3,618; 1926—3,263; 1927—2,439; 1928—2,247; 1929—3,574; 1930—2,750; 1931—1,940; 1932—5,193; 1933—10,470, and 1934—14,172 tons. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments on a dry rubber basis were: 1923—18 tons; 1924—90; 1925—6; 1926—20; 1927—½; 1928—1; 1929—2; 1930—11; 1931—2; 1932—2; 1933—1, and 1934—6 tons. (3) Official statistics. (4) Exports from "Other N. I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included in earlier years, which is as follows on a dry rubber basis: 1923—2,342 tons; 1924—1,008; 1925—2,239; 1926—44; 1927—84; 1928—1,395; 1929—437; 1930—2,744; 1931—3,874; 1932—3,488; 1933—5,260, and 1934—5,330 tons. (5) Calculated from official import statistics of principal consuming countries; also includes United States imports of guayule. (6) This total includes the third column for British Malaya and all other figures shown for other territories. (*) Figure is provisional.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,882	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	30,462	19,164	14,970	4,343	4,680	2,400	13,063	1,055,356
1938	406,343	133,079	59,660	90,200	25,696	45,836	28,170	25,650	11,944	11,309	5,092	16,034	2,400	9,936	871,349
1938:															
Mar.	42,075	15,911	4,845	10,768	2,123	6,220	1,365	2,162	1,043	961	342	1,088	200*	1,324	90,427
Apr.	31,870	14,653	5,757	6,497	999	5,454	2,397	4,281	640	904	449	971	200*	920	75,992
May	27,809	14,675	5,169	9,595	2,545	3,327	2,422	4,163	1,041	1,137	419	1,283	200*	957	74,742
June	26,429	14,053	4,542	7,478	3,243	2,145	2,399	505	805	853	663	1,149	200*	988	65,452
July	22,209	12,678	5,433	6,927	2,685	3,099	3,641	541	1,215	1,106	528	1,151	200*	635	62,048
Aug.	31,494	12,891	3,662	7,190	1,832	2,033	2,078	739	1,182	1,238	259	965	200*	595	66,358
Sept.	34,436	8,100	5,094	7,390	1,405	3,584	1,799	1,725	1,779	519	385	1,830	200*	608	68,854
Oct.	33,830	3,085	3,791	6,326	3,139	3,204	3,921	2,000*	1,780	848	420	3,022	200*	9	65,575
Nov.	32,567	936	5,322	7,275	3,123	4,665	1,984	4,000*	660	636	530	1,209	200*	379	63,486
Dec.	37,051	4,134	5,820	7,481	2,198	4,000	2,355	2,500*	647	876	263	1,013	200*	648	69,186
1939:															
Jan.	36,614	836	4,684	7,227	2,867	2,553	2,133	4,000*	910	898	454	1,037	200*	1,131	65,544
Feb.	30,578	4,773	5,315	7,569	1,451	3,263	2,025	2,000*	1,741	1,068	184	858	200*	524	61,549
Mar.	45,286	8,082	4,503	8,036	2,458	4,019	1,525	2,000*	1,316	1,242	368	1,133	200*	463	80,631
Apr.	31,590	4,752	5,639	8,719	1,466	3,579	1,926	2,000*	1,108	855	333	1,062	200*	597	63,826
May	45,390	7,531	4,646	8,413	3,006	4,438	1,573	2,000*	1,188	792	518	1,654	200*	618	81,967
June	33,951	8,439	4,649	8,190											

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1]—United States imports of guayule are included in this compilation. *—Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE: THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.